M E M O R A N D U M

To: Ed Garvey and Shane McDonald, Malcolm-Pirnie

Subject: Comments on Sediment Stability in the Lower Passaic River based on analysis of side-scan Sonar, multibeam and single beam bathymetry, sediment samples and sediment probing.

From: Roger Flood, Stony Brook University

Date: April 28, 2008

I have looked at the side-scan sonar data, multibeam and single-beam bathymetry data, available sediment samples and recent probing data in an attempt to describe and understand variations in sediment deposition and erosion patterns along the Lower Passaic River from about RM 0.5 to RM 13.5. The results of the analysis have been primarily qualitative and are based on an analysis of sedimentary processes based on surface morphology and temporal change. The detailed results are presented in the description and discussion of 16 areas (Figure 1) and 41 figures (Fig 2 to 42) of the Lower Passaic River (attached).

In summary, the Lower Passaic River appears to be depositional below about RM 1 as man-made disturbance is smoothed out by more recent deposition. From RM 1.41 to at least RM 3.58 there appears to have been net deposition between 2004 and 2005 followed by net erosion from 2005 to 2007. At RM 3.58 the erosion may have occurred through mass erosion at some places rather than particle-by-particle erosion. At RM 7.53 the pattern has changed somewhat, with aggradation occurring between 2005 and 2007. North of RM 8 the sediments in the river are generally coarser and there is quite a bit of local variability. Some of the variability seems to be a result of structures in the river (e.g., a coarse, rough area at RM 9.43, the mouth of the Third River at RM 11.15, a rail-road bridge at RM 11.43, and the Rutherford Avenue bridge at RM 11.64). If these structures are modified or removed, then the sediment deposited near the structures may be remobilized. There are also several instances where a relatively thin veneer of sand is present in some years but absent in other years, perhaps related to sandy sediment movement through the system (e.g., at RM 7.53, 8.29, 9.81, 13.35 and 13.45).

Above RM 8 it appears that some fine-grained sediment lying below the depth of past dredging is being eroded. Based on navigation charts, it appears that the project depth above RM in about 8 has been 10 feet MLW, which is the equivalent of about 12.3 feet NAVD88, since at least the mid 1940s. If that is the case, then a modern river bed deeper than about 13 feet NAVD88 is likely to be formed in old sediment and thus may not be floored by contaminated sediment.

FIGURE CAPTIONS (grouped by survey area)

FIGURES

<table>
<tr><th>River Mile</th><th>Fig</th><th>Layers</th><th>Observations</th></tr>
<tr><td rowspan="3">0.67</td><td>2</td><td>depth change 2005 to 2007<br>sun-illuminated 2007 multibeam depth</td><td rowspan="2">The Passaic River flows to the south at RM 0.67, and upstream is towards the north. Fig 3 shows a generally smooth seafloor in 2005, although a large groove is seen at the eastern side of the side-scan sonar coverage at A. The groove was probably caused by a barge running aground. The groove at A on Fig 3 is not visible on the 2007 bathymetry data (Fig 2) suggesting that sediment deposition between 2005 and 2007 has smoothed out this feature. Fig 2 also shows two arcuate grooves and one set of linear grooves in the sea bed near B. These grooves, and the irregular sea bed between the arcuate grooves, were probably caused by more than one barge or ship running aground.<br>Fig 2 shows depth changes between 2005 and 2007, and depth differences between the two years are noted near the arcuate grooves. Thus the depth difference between 2005 and 2007 at B is due to the disruption of the sea bed that occurred between 2005 and 2007. The bathymetric data from 2004 and 2005 cross in only a few places; however, the depth change between 2004 and 2005 is generally greater than the depth change between 2005 and 2007 suggesting that there is temporal as well as spatial variability in accumulation rates.</td></tr>
<tr><td>3</td><td>depth change 2004 to 2007<br>sun-illuminated 2007 multibeam depth<br>side-scan sonar 2005 images</td></tr>
<tr><td colspan="3">Conclusions: RM 0.67 has been a depositional area between 2004 and 2007, although there may have been more deposition here between 2004 and 2005 than between 2005 and 2007. There is also some man-made disruption of the sea bed in this part of the river due to shipping, and thus not all sea-bed disturbances here are due to natural causes.</td></tr>
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<tr><th>River Mile</th><th>Fig</th><th>Layers</th><th>Observations</th></tr>
<tr><td rowspan="4">1.41</td><td>4</td><td>depth change 2004 to 2007<br>sun-illuminated 2007 multibeam depth</td><td rowspan="3">First, the black triangle in the center of Figs 4 and 5 is an artifact of the way the sun-illuminated bathymetry images were created. The black background of one image is obscuring the image on the underling image. Also, Fig 5 shows the scale for the depth change layer used on all figures.<br>The Passaic River flows to the south at RM 1.41, and upstream is towards the north. The sun-illuminated multibeam image shows a generally smooth sea floor with some slight irregular mounds that range from about 5 to 30 feet in diameter. There are some possible scour marks that extend north from some of the features (e.g., at C) suggesting that the sea bed was locally eroded by northward-flowing currents. The depth changes shown on Figs 4 and 5 suggest about 0.5 to 1 foot of accumulation from 2004 to 2007 but 0.5 to 1 foot of erosion from 2005 to 2007 suggesting that the deposition occurred primarily from 2004 to 2005. The side-scan sonar record in Fig 6 shows a lineated sea bed at D in 2005 which would be consistent with deposition occurring prior to 2005.<br>Fig 7 shows shapefiles determined by Malcolm Pirnie that are represent areas of non-erosion (yellow) or consistent deposition (pink) based on single-beam surveys from 1995 to 2004. The depth change data from 2004 to the present is generally consistent with this, except that there appeared to be erosion from 2005 to 2007 in areas that had previously shown only deposition or had no erosion.</td></tr>
<tr><td>5</td><td>depth change 2005 to 2007<br>sun-illuminated 2007 multibeam depth<br>depth change scale</td></tr>
<tr><td>6</td><td>depth change 2004 to 2007<br>side-scan sonar 2005 images</td></tr>
<tr><td>7</td><td>depth change 2004 to 2007<br>side-scan sonar 2005 images<br>consistent depositional areas<br>consistent non-erosional areas</td></tr>
<tr><td></td><td colspan="3">Conclusions: The morphology and depth changes at RM 1.41 are consistent with an interval of deposition from 2004 to 2005 followed by some erosion between 2005 and 2007. The period of deposition is characterized by a lineated (furrowed) bed on the side-scan sonar data while the period with some erosion is characterized by a bed with small, irregular mounds. The sea-floor lineations are consistent with some erosion having occurred by currents flowing to the north (into the Passaic River).</td></tr>
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| River Mile | Fig | Layers | Observations |
|---|---|---|---|
| 3.0 | 8 | sun-illuminated 2007 multibeam depth | The Passaic River flows to the east at RM 3.0, and upstream is towards the west. The sun-illuminated bathymetry of Figs 8 and 9 shows a somewhat lineated bed on the north side of the river at E and a more lumpy or mounded bed on the south side of the river at F. There are some sediment tails or scour marks behind mounds near E that suggest upriver flow while sediment tails or scour marks behind mounds near F tend to suggest downriver flow. There is a somewhat different character to the bed at G where there is an elongate ridge on the bottom, but there is no information as to what is different on the bed here. A DESA sample from the northern edge of the river here shows a mixture of gravel + sand + mud while a DESA sample from the center of the river north of G shows a mixture of sand + mud.<br>The depth change data in Fig 9 show that the bed in 2007 was about 0.5 to 1 foot lower than in 2004 and 2005 on the north side and in the center of the river, but similar in depth on the south side of the river. In contrast, the bed on the south side of the river is in some places up to a foot higher in 2007 than in 2004 and 2005, including in the anomalous zone at G. Since the amount of erosion is similar from 2004 to 2007 and from 2005 to 2007, it is likely that the erosion occurred between 2005 and 2007.<br>The side-scan record from 2005 in Fig 10 shows a lineated (furrowed) bed on the north side of the river and a mounded or lumpy bed on the south side of the river (including at G). The lineated bed on the north side of the river is consistent with a period of accumulation prior to 2005 while the lumpy bed on the southern side is consistent with an interval of little deposition or possible slight erosion.<br>Fig 12, based on single-beam surveys from 1996 to 2004, suggests that the south side of the river here is non-erosive with no negative depth changes. The more recent data is consistent with that conclusion, although our observation is that the are might be more properly characterized as a region with little deposition rather than a region with little erosion. |
| | 9 | depth change 2004 to 2007<br>sun-illuminated 2007 multibeam depth | |
| | 10 | side-scan sonar 2005 images | |
| | 11 | depth change 2004 to 2007<br>depth change 2005 to 2007<br>side-scan sonar 2005 images | |
| | 12 | depth change 2004 to 2007<br>depth change 2005 to 2007<br>consistent depositional areas<br>consistent non-erosional areas<br>sun-illuminated 2007 multibeam depth | |
| | Conclusions: The bed at RM 3.0 experiences both deposition and erosion, although there was at least one period of erosion between 2005 and 2007. Sediment transport patterns are upriver on the north side of the river and downriver on the south side. This flow pattern appears to be consistent with flow in a river bend. | | |

| River Mile | Fig | Layers | Observations |
|---|---|---|---|
| 3.58 | 13 | sun-illuminated 2007 multibeam depth | At RM 3.58 the Passaic River flows to the northeast in a river bend, so upstream is towards the southwest.<br>The sun-illuminated 2007 bathymetry in Fig 13 shows that the river bed at RM 3.58 is generally mounded on the outside of the bend and smoother on the inside of the bend except that there are two relatively large erosional scours in the center of the channel. The scour at H is 25 feet wide and 120 feet long while the scour at I is at least 400 feet long and up to 50 feet wide. The two scours are narrower on the downstream end (upper right), suggesting that the bed was scoured by one or more upriver flows. The scour at H may have been formed downstream of a small mound. There is a second patch of anomalous river bed in along the shore in the southwest portion of the image which is similar to the patch at G in Fig 8.<br>Five cross-sections are shown in Figs 15 and 16 to better illustrate the nature of the scour in the center of the river. All of the cross-sections on Fig 16 show that some erosion has occurred in the center of the channel. Cross-sections 1 and 2 are from downstream of scour H, cross-section 3 crosses scour H, and cross-sections 4 and 5 cross scour I. The points from 2004 show the depths reported for the single-beam survey while the points for 2007 were taken from the multibeam depth grid at the locations of the 2004 depth samples. Overall, the river bed in 2007 was generally deeper than the river bed in 2004 or 2005 except in the southeastern side of the river where there is either little depth change or some deposition. The bed is distinctly deep where the cross-sections cross scours H and I, and the sharp boundaries of the scour depressions may indicate that the erosion that occurred here was by mass erosion of the river bed rather than by particle-by-particle erosion.<br>Fig 17 shows a side-scan sonar record collected in 2005 that covers the area of scours H and I, but shows no indication of a disrupted river bed at those locations. Fig 18 suggests that the river bed here has experienced a number of erosional events except for a zone along the southeastern side of the channel. |
| | 14 | depth change 2004 to 2007<br>depth change 2005 to 2007<br>sun-illuminated 2007 multibeam depth | |
| | 15 | depth change 2004 to 2007<br>depth change 2005 to 2007<br>cross-sections 1-5<br>sun-illuminated 2007 multibeam depth | |
| | 16 | depth cross-sections 1-5 for 2004 and 2007 | |
| | 17 | side-scan sonar 2005 images<br>sun-illuminated 2007 multibeam depth | |
| | 18 | depth change 2004 to 2007<br>depth change 2005 to 2007<br>consistent depositional areas<br>consistent non-erosional areas<br>sun-illuminated 2007 multibeam depth | |
| | Conclusions: Two large scours at RM 3.58 may indicate that the river bed can experience mass erosion as well as particle-by-particle erosion during erosive events. The event or events that created these scours occurred between 2005 and 2007. | | |

<table>
<tr><th>River Mile</th><th>Fig</th><th>Layers</th><th>Observations</th></tr>
<tr><td rowspan="6">7.53</td><td>19</td><td>sun-illuminated 2007 multibeam depth</td><td rowspan="5">The Passaic River flows to the southwest at RM 7.53, and upstream is towards the northeast. The sun-illuminated 2007 bathymetry in Fig 19 shows a river bed that is generally smooth with a few mounds on the eastern side and less smoothed with mounds commonly present on the western side. On the eastern side, sediment tails behind mounds extend towards the northeast (upstream) while sediment tails on the western side are less distinct but appear to extend towards the southwest (downstream). A DESA sediment sample immediately south of this figure shows a well-sorted sand in a smoothed area.<br>The depth change data suggests both erosion and deposition in this area. There tends to be little change in depth between 1995 and 2007 (not shown) and between 2004 and 2007 (Fig 20), although there are some localized areas of depths in 2007 being 0.5 to 1.5 ft shallower along the eastern side. There tends to be a consistent shoaling along the eastern side of 0.5 to 1.5 ft from 1989 to 2007 (not shown) and from 2005 to 2007 (Fig 21), with a deepening of 0.5 to 3 ft along the western side from 1998 to 2007. These observations suggest that there was net erosion on the eastern side from 2004 to 2005 and then net shoaling from 2005 to 2007, but little change in depth on the western side during these times.<br>The side-scan sonar date collected in 2005 (Fig 22) shows that the river bed was mounded on both the eastern and western sides, although there are fewer mounds on the eastern side. Some of the mounds identified on the side-scan sonar record on the eastern side can be observed in the 2007 multibeam data, although they appear to be less prominent in 2007 consistent with net sediment accumulation between 2005 and 2007 on the eastern side having nearly buried many of the mounds (Fig 23).</td></tr>
<tr><td>20</td><td>depth change 2004 to 2007<br>sun-illuminated 2007 multibeam depth</td></tr>
<tr><td>21</td><td>depth change 2005 to 2007<br>sun-illuminated 2007 multibeam depth</td></tr>
<tr><td>22</td><td>side-scan sonar 2005 images</td></tr>
<tr><td>23</td><td>depth change 2005 to 2007<br>side-scan sonar 2005 images</td></tr>
<tr><td colspan="3">Conclusions: The eastern side of the river bed at RM 7.53 appears to have eroded and aggraded by up to about 1.5 ft since 1989, with the most recent change being aggradation between 2005 and 2007. The river bed on the eastern side in 2007 showed a generally smooth river bed that appears to have been deposited by up-river flows. In contrast, the western side of the channel appears to have been more stable since 1995, the bed there has a mounded character, and sediment tails suggest that the bottom has been modified by down-river flows. These observations suggest that a mounded river bed may be characteristic of a period of non-deposition or slight erosion while a smooth river bed may be characteristic of recent deposition. This recent deposition will bury, or nearly bury, the mounds that would otherwise be characteristic of the river bed.</td></tr>
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<tr><th>River Mile</th><th>Fig</th><th>Layers</th><th>Observations</th></tr>
<tr><td rowspan="5">8.29</td><td>24</td><td>sun-illuminated 2007 multibeam depth</td><td rowspan="4">The Passaic River flows to the south at RM 8.29, and upstream is towards the north. The river-bed morphology imaged in the 2007 multibeam data (Fig 24) shows a somewhat smoothed bed in the central part of the channel (with some sand waves at J) and a mounded bed along the west and east sides of the channel. The sediment type here was determined from probing done by Malcolm Pirnie in 2008 (Fig 25). For the channel, sand was often found lying over coarser, gravelly sediment while some silt or sandy silt was found along the eastern edge (perhaps in depressions in a mounded area and sometimes on top of sand). There are two instances where sand is found over silt suggesting that sand is capping silty sediment. However, it is not known whether the buried silty sediments represent large or small deposits.<br>The side-scan sonar record from 2005 has some artifacts due to fish motion (Fig 26), but the record appears not to show the sand waves imaged in the multibeam data (Fig 24) suggesting that the sand waves are not always present. Depth change data (Fig 27) suggests that bottom depths have generally not changed between 1989 to 2007 (not shown), 2004 and 2007 or 2005 and 2007.</td></tr>
<tr><td>25</td><td>probing results<br>sun-illuminated 2007 multibeam depth</td></tr>
<tr><td>26</td><td>side-scan sonar 2005 images<br>sun-illuminated 2007 multibeam depth</td></tr>
<tr><td>27</td><td>depth change 2004 to 2007<br>depth change 2005 to 2007<br>probing results<br>side-scan sonar 2005 images<br>sun-illuminated 2007 multibeam depth</td></tr>
<tr><td colspan="3">Conclusions: The river bed at RM 8.29 is generally coarse although there are some apparently limited pockets of silt or sandy silt. There is often a surface sand layer overlying a gravelly layer in a smoothed area of the river bed. Water depths in the main channel here range from about 12 to 15 feet NAVD88.</td></tr>
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| River Mile | Fig | Layers | Observations |
|---|---|---|---|
| 8.94 | 28 | depth change 1989 to 2007<br>probing results<br>sun-illuminated 2007 multibeam depth | The Passaic River flows to the southwest at RM 8.94, and upstream is towards the northeast. The sun-illuminated depth data from 2007 suggest a mounded river bed with some sediment deposition over and between the mounds (Fig 28). There are some tails behind mounds, often suggesting downstream flows. The DESA sediment analyses (from 2005) and Malcolm Pirnie probing results (from 2008) indicate a sandy bed in the middle of the river with some gravel, often overlying silty sediments, but a silty bed along the eastern margin, often overlying sand or gravel.<br>There is little change in river-bed depth between 2004 and 2007 or between 2005 or 2007 (not shown), but there has been a long-term net aggradation of up to 3 feet from 1989 to 2007 (Fig 28) for most of the river bed except for a zone of net erosion of up to 3 to 5 feet along the eastern side where finer sediments are now reported. Both the aggradation and erosion appear to have occurred between 1989 and 2004. |
| | Conclusions: The river bed at RM 8.94 is generally sandy except for a silty region at the eastern edge. The sandy bed appears to be overlying a silty sediment. Water depths in the main channel here range from about 12 to 16 feet NAVD88. | | |

| River Mile | Fig | Layers | Observations |
|---|---|---|---|
| 9.40 | 29 | depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth | The Passaic River flows to the southwest at RM 9.40, and upstream is towards the northeast, and the black triangle is an artifact where two different images overlap. The morphology in this area (Fig 29) is similar to that at RM 8.94 (Fig 28) except that the river bed is much deeper (depths to about 24 feet NAVD88) downstream from a rough, coarse deposit at K (water depth 14 feet NAVD88). These deeper depths may result from scour downstream from the rough, coarse deposit. Almost all the probes in the depression show silty sediment or sand / gravel over silty sediment. DESA samples exist only at the downstream edge of the deposit at K and show a gravel-sand-mud mix or a well-sorted sand. |
| | Conclusions: There appears to have been erosion of fine-grained sediments at from RM 9.32 to RM 9.41 downstream from a coarse, rough deposit at RM 9.43. This erosion may be related to the presence of the coarse deposit. There may also be some limited erosion north of this coarse deposit. | | |

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<tr><th>River Mile</th><th>Fig</th><th>Layers</th><th>Observations</th></tr>
<tr><td rowspan="3">9.81</td><td>30</td><td>depth change 1989 to 2007<br>probing results<br>sun-illuminated 2007 multibeam depth</td><td rowspan="2">The Passaic River flows to the south-southeast at RM 9.81, and upstream is towards the north-northwest. The river bed here is generally smooth on the eastern side with down-stream tending sediment tails, but more irregular on the western side with some of the irregularity possibly due to earlier dredging and with some upstream-tending tails (Fig 30). The side-scan sonar data from 2005 shows a similar pattern, but perhaps with more mounds exposed on the eastern side (Fig 31). There is a faint indication of sand waves in the channel at the north end of the image, but they are not present on the side-scan sonar record (Fig 31). Sediment samples from this area show silt or silty sand on the eastern side and sand and gravel in the center of the channel. There is one silt sample on the western side and one sample with sand over sandy silt. The silt sample in the channel is found at a water depth of 18 feet NAVD88 and may be a sample of fine-grained sediment that filled an earlier river channel.<br>There are some changes in depth from 2004 to 2007 and from 2005 to 2007, but the patterns are patchy. There is a more systematic depth change from 1989 to 2007 (Figs 30 and 31) with a general shoaling of 0.5 to 6 feet, with the primary shoaling occurring on the eastern side of the river (at the inside of a river bend).</td></tr>
<tr><td>31</td><td>depth change 1989 to 2007<br>probing results<br>side-scan sonar 2005 images</td></tr>
<tr><td colspan="3">Conclusions: The river bed at RM 9.81 is generally fine grained on the eastern side and coarser (sand and gravel) in the center of the channel. There is some silt and sandy silt in the deepest part of the channel which may sample fine-grained sediments that filled the river channel at an earlier time. Fine-grained sediments appear to have accumulated on the eastern side of the river since 1989.</td></tr>
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<tr><th>River Mile</th><th>Fig</th><th>Layers</th><th>Observations</th></tr>
<tr><td rowspan="3">10.67</td><td>32</td><td>depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth</td><td rowspan="2">The Passaic River flows to the south at RM 10.67, and upstream is towards the north. The river-bed morphology imaged in the 2007 multibeam data (Fig 32) shows a distinct mounded and deeper river bed along the western side of the river (depth range 14 to 17 feet NAVD88) with a smoother, somewhat shallower area with some sand waves on the eastern side of the river in the south (depth range 11 to 13 feet NAVD88). Sediment samples show the sand waves to be developed in well-sorted sandy sediments while the deeper area is sand and gravel. A probe along the eastern edge of the river suggest silt in 2008. The side-scan sonar data from 2005 also show sand waves (Fig 33), and there appear to be sand waves in the northern part of the image where sand waves may not have been present in 2007. A probe from this region shows 1 foot of silt over sand, suggesting localized deposition of fine sediment in this area between 2005 and 2007.<br>There are few systematic patterns in depth change from 2004 to 2007 or from 2005 to 2007 with depth changes generally less than 1 foot. There are larger depth changes between 1989 to 2007 with aggradation generally between 1 and 3 feet although up to 5 feet in some areas.</td></tr>
<tr><td>33</td><td>depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>side-scan sonar 2005 images</td></tr>
<tr><td colspan="3">Conclusions: The river bed at RM 10.67 shows distinct zonation with a deeper, mounded, coarse area on the western side of the channel and a somewhat shallower, sandy or silty area with sand waves on the eastern side of the channel. This appears to be an area of aggradation from 1989 to 2007.</td></tr>
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| River Mile | Fig | Layers | Observations |
|---|---|---|---|
| 11.15 | 34 | depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth | The Passaic River flows to the west-southwest at RM 11.15, and upstream is towards the east-northeast. The Third River enters the Passaic River on the northwest side of the river at RM 11.24 where there is a sediment shoal on the northwest side. There is a change in river bed character at the shoal, with the sun-illuminated depth data in 2007 showing a somewhat smoothed river bed downstream of the shoal, a more mounded river bed opposite the shoal, and a somewhat smoothed river bed upstream of the shoal (Fig 34). Sediment tails pointing southwest in the smoothed regions tend to suggest that the bed has been primarily modified by downstream flows. Sediment samples and probes suggest coarser sediments to opposite and upstream of the shoal but silt downstream from the shoal. However, the probes downstream of the shoal generally show that the silt overlies sand or gravel. There is little systematic depth change between 2004 and 2007 or between 2005 and 2007, but there does seem to be a long-term aggradation of about 1 to 3 feet downstream of the shoal (Fig 34). |
| | Conclusions: Sedimentation patterns on the river bed at RM 11.15 appear to be related to the presence of a shoal and of the Third River, and the sediment deposited downstream of the shoal may enter the Passaic River at the Third River. Sediment from the Third River appears to extend downriver to the area imaged in Figs 32 and 33. The local deposition pattern may also be affected by the presence of the shoal, and removing the shoal might destabilize the sediment deposited downstream of the shoal. | | |

| River Mile | Fig | Layers | Observations |
|---|---|---|---|
| 11.38 | 35 | depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth | The Passaic River flows to the west-southwest at RM 11.15, and upstream is towards the east-northeast, and the black triangles are artifacts created where two different images overlap. A rail-road bridge crosses the Passaic River at RM 11.43, and the bridge appears to have affected sedimentation downstream from the bridge (Fig 35). In particular, a prominent sediment ridge (400 ft long, 40 ft wide and up to 5 feet high) extends downstream from the north bulkhead of the bridge. Based on two probe samples, the ridge appears to be silty sediment deposited on sand or gravel, and based on depth change data the ridge may have grown substantially between 1989 and 2004. There is a fairly deep scour hole downstream from the southern opening of the bridge (100 feet long, 50 feet wide, scour depth to about 7 feet, water depth to about 25 feet NAVD88) that could have eroded into fine-grained sediment since 1989. |
| | Conclusions: The railroad bridge at RM 11.43 appears to have affected sedimentation patterns within about 500 feet downstream of the bridge, and a prominent sediment deposit has formed downstream of the bridge. This deposit may become destabilized if the bridge is removed or modified. There is also a scour hole downstream of the bridge that could be eroded into fine sediment. | | |

| River Mile | Fig | Layers | Observations |
|---|---|---|---|
| 11.61 | 36 | depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth | The Passaic River flows to the southwest at RM 11.61, and upstream is towards the northeast. The Rutherford Avenue bridge crosses the Passaic River at RM 11.64, and the bridge appears to have affected sedimentation downstream from the bridge (Fig 36). This figure overlaps with Fig 35 which is immediately downstream. As at the rail-road bridge, a pronounced sediment deposit has formed downstream of the north bulkhead of the bridge. The sediment deposit is about 600 feet long, 30 to 40 feet wide, up to 5 feet thick, and it appears to have formed primarily since 1989. No samples are in this deposit, but those at the edge of the deposit range from silt over sand to silty sand. There does not appear to be any scour associated with this bridge. |
| | Conclusions: The Rutherford Avenue bridge at RM 11.64 appears to have affected sedimentation patterns at this point in the Passaic River as a prominent sediment ridge extends downstream from the north bulkhead. If the bridge is removed or modified, this sediment deposit could become unstable and be eroded. | | |

| River Mile | Fig | Layers | Observations |
|---|---|---|---|
| 11.91 | 37 | depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth | The Passaic River flows to the south at RM 11.91, and upstream is towards the north. The river-bed morphology imaged in the 2007 multibeam data (Fig 37) shows a mounded river bed suggestive of erosion and with little depositional cover. Water depths range from about 13 to 15 feet NAVD88. Sediment samples report well-sorted sands, gravel + sand + mud mixture, and gravels. One probe at the western edge of the channel reported silt overlying sand. Depth changes from 1989 to 2007 indicate erosion of up to 2.5 foot, consistent with depth changes from 2004 to 2007 and 2005 to 2007. |
| | Conclusions: The Passaic River at RM 11.91 had an erosional morphology in 2007, consistent with apparent net erosion from 1989 to 2007. The coarse river-bed sediments suggest a lag deposit. | | |

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<tr><th>River Mile</th><th>Fig</th><th>Layers</th><th>Observations</th></tr>
<tr><td rowspan="3">13.35</td><td>38</td><td>depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth</td><td rowspan="2">The Passaic River flows to the south at RM 13.35, and upstream is towards the north. The river-bed morphology imaged in the 2007 multibeam data (Fig 38) shows a field of mounded sand waves with wavelengths of about 25 feet. Water depth ranges from about 10 to 17 feet NAVD88. A few mounds appear to poke through this mounded sediment cover. Probe samples in 2008 suggest that up to about 1 foot of sand overlies a sandy silt (large red dots). Side-scan sonar data collected in 2005 (Fig 39) show a much different river-bed character, with numerous mounds being present on the river bed. Comparisons of depths between 2004 and 2007 and between 2005 and 2007 suggest some accumulation in the region, but generally less than 0.5 to about 1 foot. Comparisons between 1989 and 2007 suggest that the sediment surface has aggraded up to 2.5 feet in that time interval.</td></tr>
<tr><td>39</td><td>depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>side-scan sonar 2005 images<br>sun-illuminated 2007 multibeam depth</td></tr>
<tr><td colspan="3">Conclusions: The Passaic River at RM 13.35 had a depositional morphology in 2007, consistent with apparent net deposition from 1989 to 2007. However, the side-scan and multibeam morphological data suggest that sandy sediments can move through the system, possibly covering and uncovering sandy silt sediments.</td></tr>
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<table>
<tr><th>River Mile</th><th>Fig</th><th>Layers</th><th>Observations</th></tr>
<tr><td rowspan="4">13.45</td><td>40</td><td>depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth</td><td rowspan="3">The Passaic River flows to the south at RM 13.45, and upstream is towards the north. Figs 40 and 41 are immediately upstream from Figs 38 and 39, and water depth ranges from 10 to 16 feet NAVD88. The river-bed morphology imaged in the 2007 multibeam data (Fig 40) shows a field of mounded sand waves similar to those shown in Fig 38. DESA sediment samples collected in 2005 suggest a well-sorted sand in the area while probe samples collected in 2008 more commonly suggest a fine sand, silty sand or a thin sand layer over silt. These two sets of observations could indicate that the sediment type here has changed between 2005 and 2007. Depth changes from 1989 to 2007 (Fig 40) indicate that there has been up to about 4 feet of erosion in this area over that time period, but depth changes from 2004 to 2007 suggest either no change or some aggradation up to about 1 foot in this area (Fig 41). Less depth change is seen between 2005 and 2007 (not shown).<br>Side-scan sonar data collected in 2005 in this area shows that some type of regular sediment bedform was present in 2005. This is in contrast to Fig 39 where the 2005 sonar data show a more mounded sediment surface in 2005. However, the bed here in 2005 has a chevron appearance rather than a regular wave appearance, suggesting that sedimentary processes were somehow different in 2005.</td></tr>
<tr><td>41</td><td>depth change 1989 to 2007<br>depth change 2004 to 2007<br>probing results<br>DESA sediment analysis<br>sun-illuminated 2007 multibeam depth</td></tr>
<tr><td>42</td><td>depth change 1989 to 2007<br>probing results<br>DESA sediment analysis<br>side-scan sonar 2005 images</td></tr>
<tr><td colspan="3">Conclusions: The Passaic River at RM 13.45 had a depositional morphology in 2007, even though there was apparent net erosion from 1989 to 2007 and the mounded channel floor was not exposed in 2005. In this area the side-scan and multibeam morphological data are still consistent with the suggestion that sandy sediments can move through the system, possibly covering and uncovering sandy silt sediments.</td></tr>
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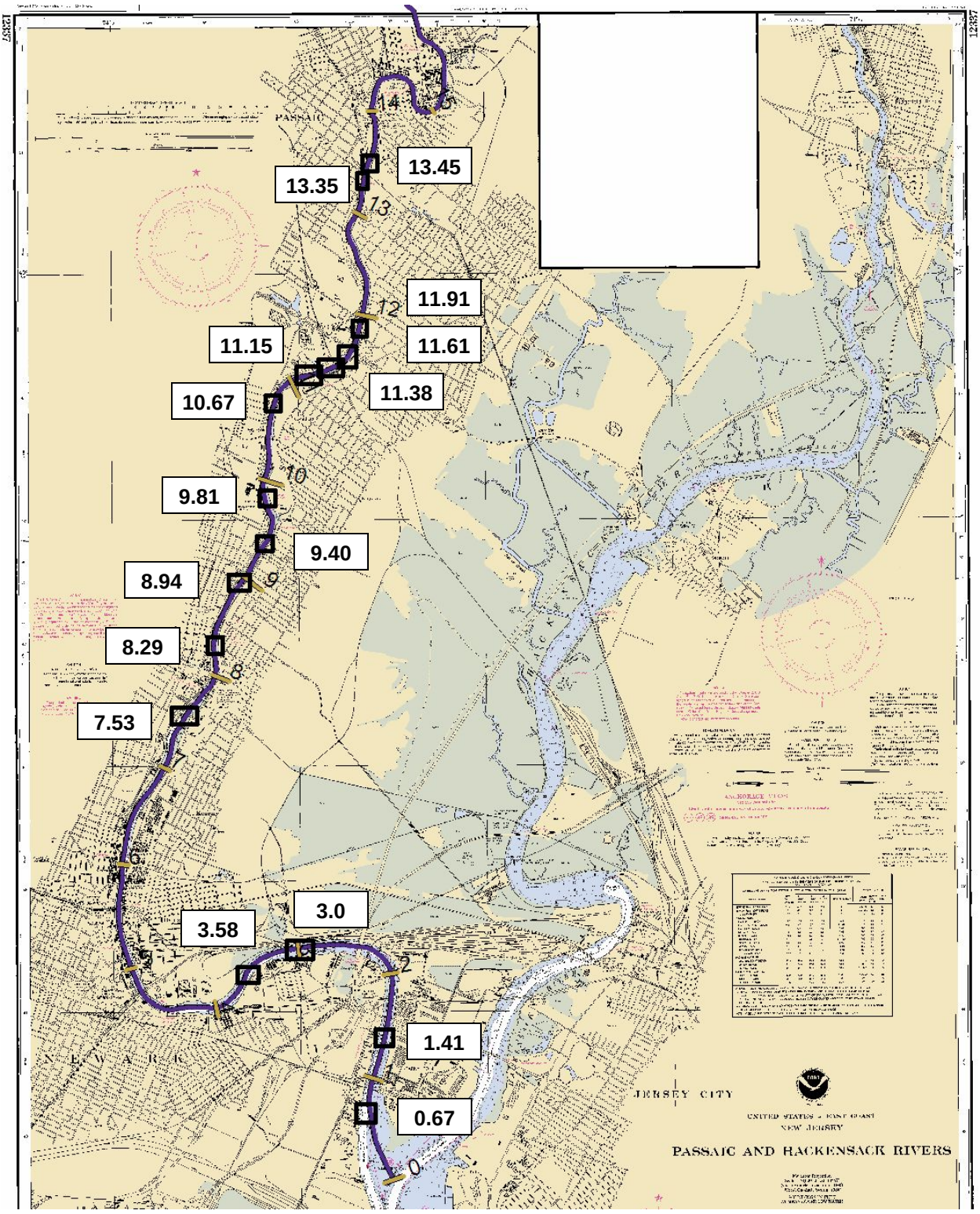
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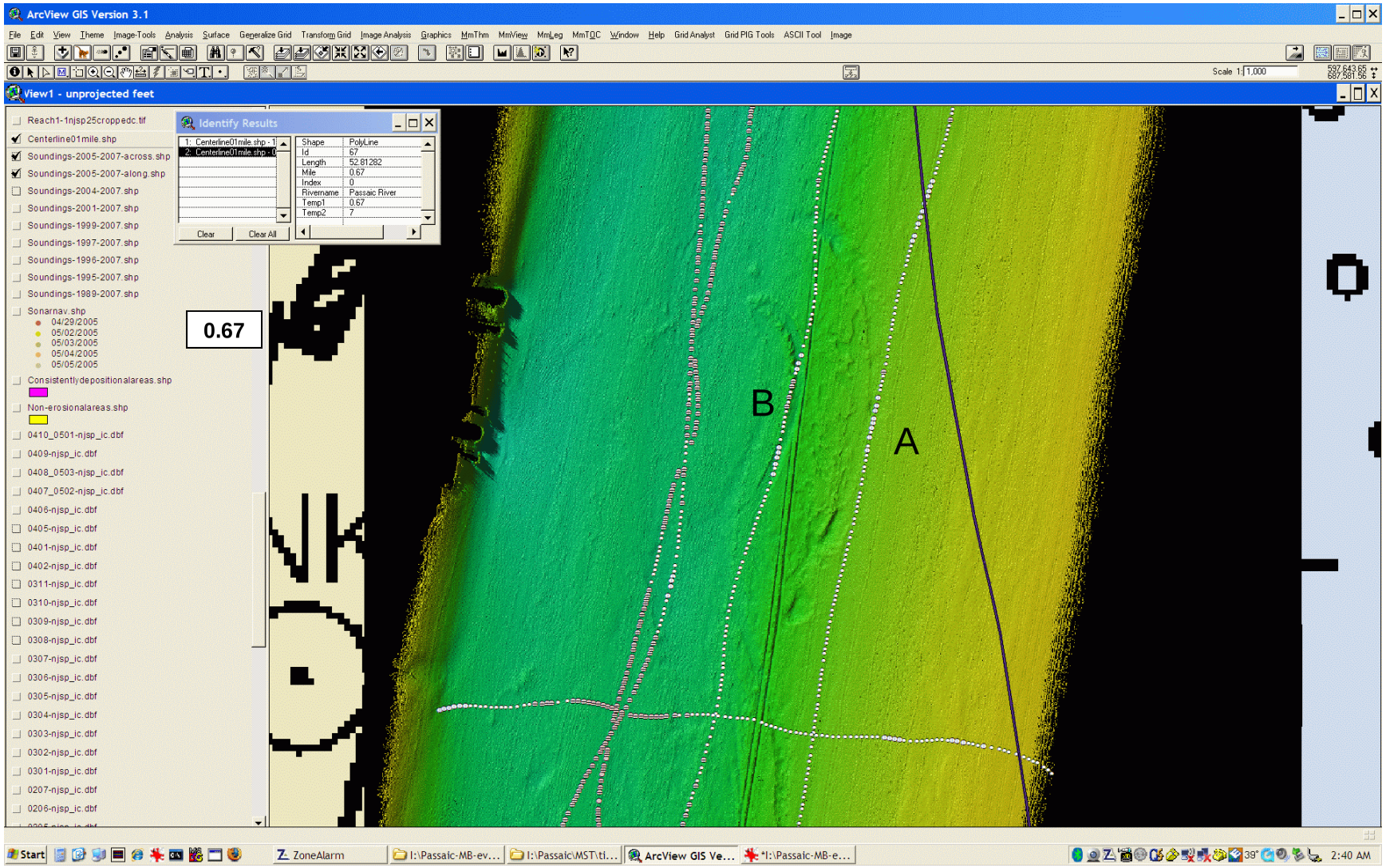
JERSEY CITY
PASSAIC AND HACKENSACK RIVERS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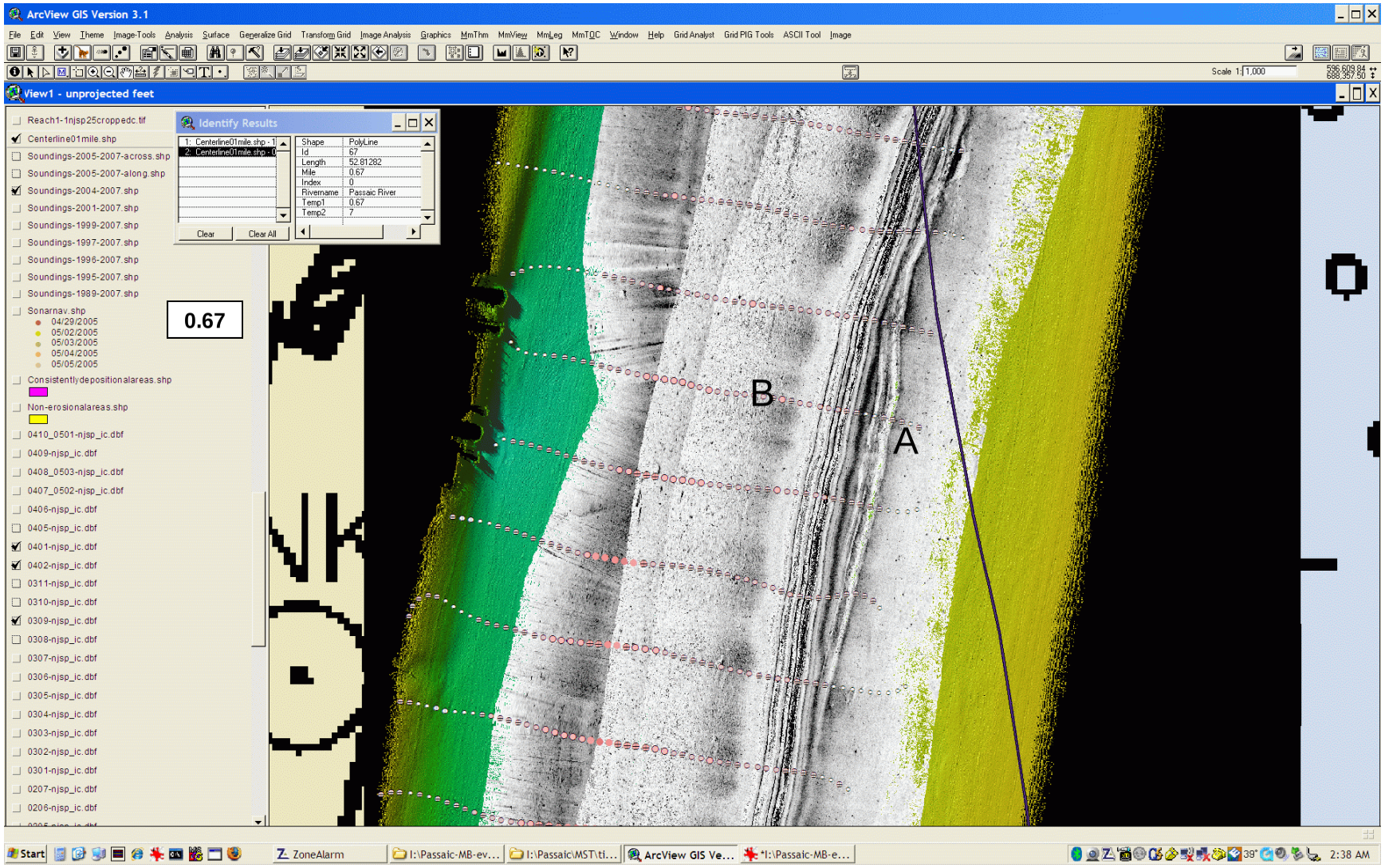
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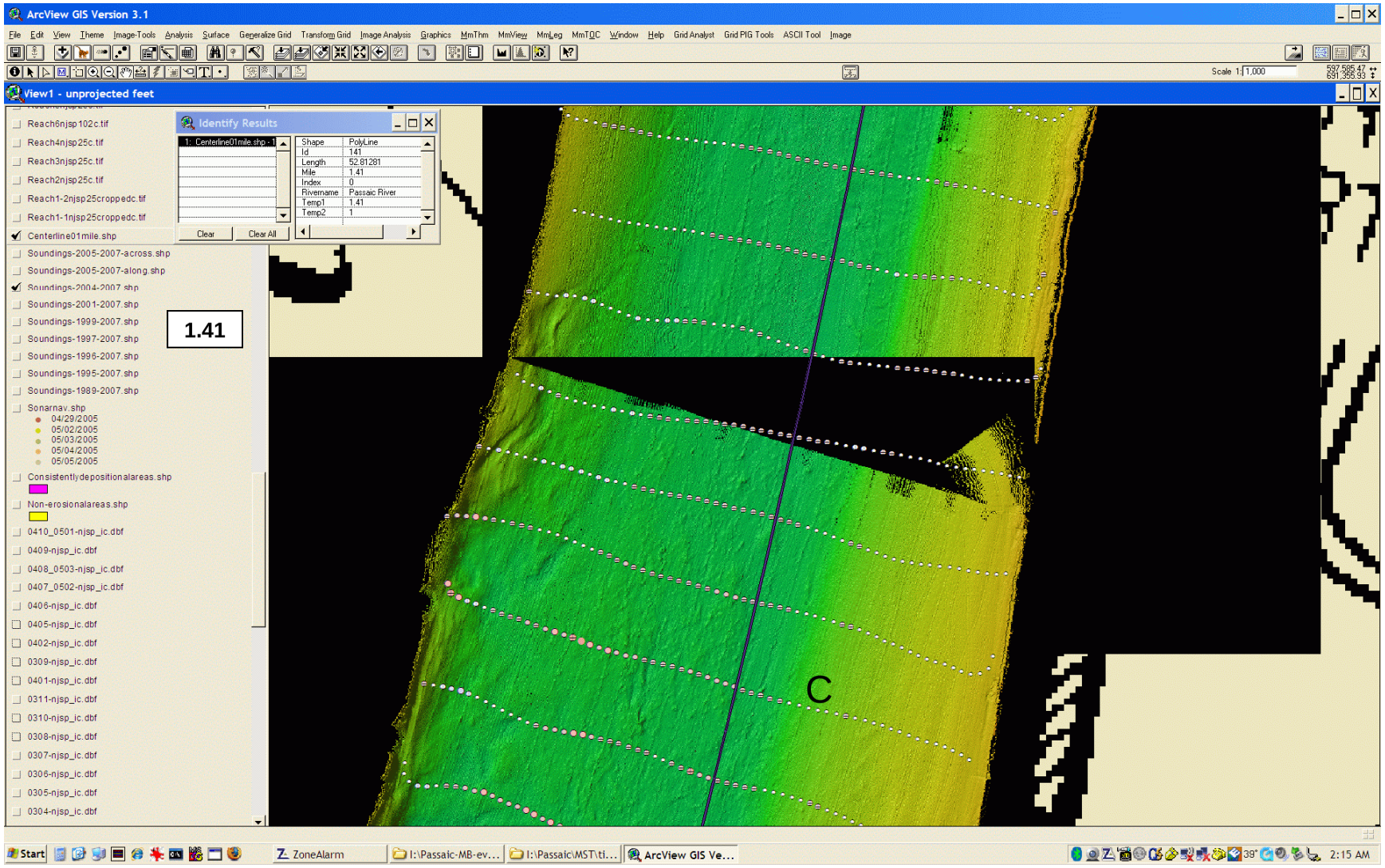
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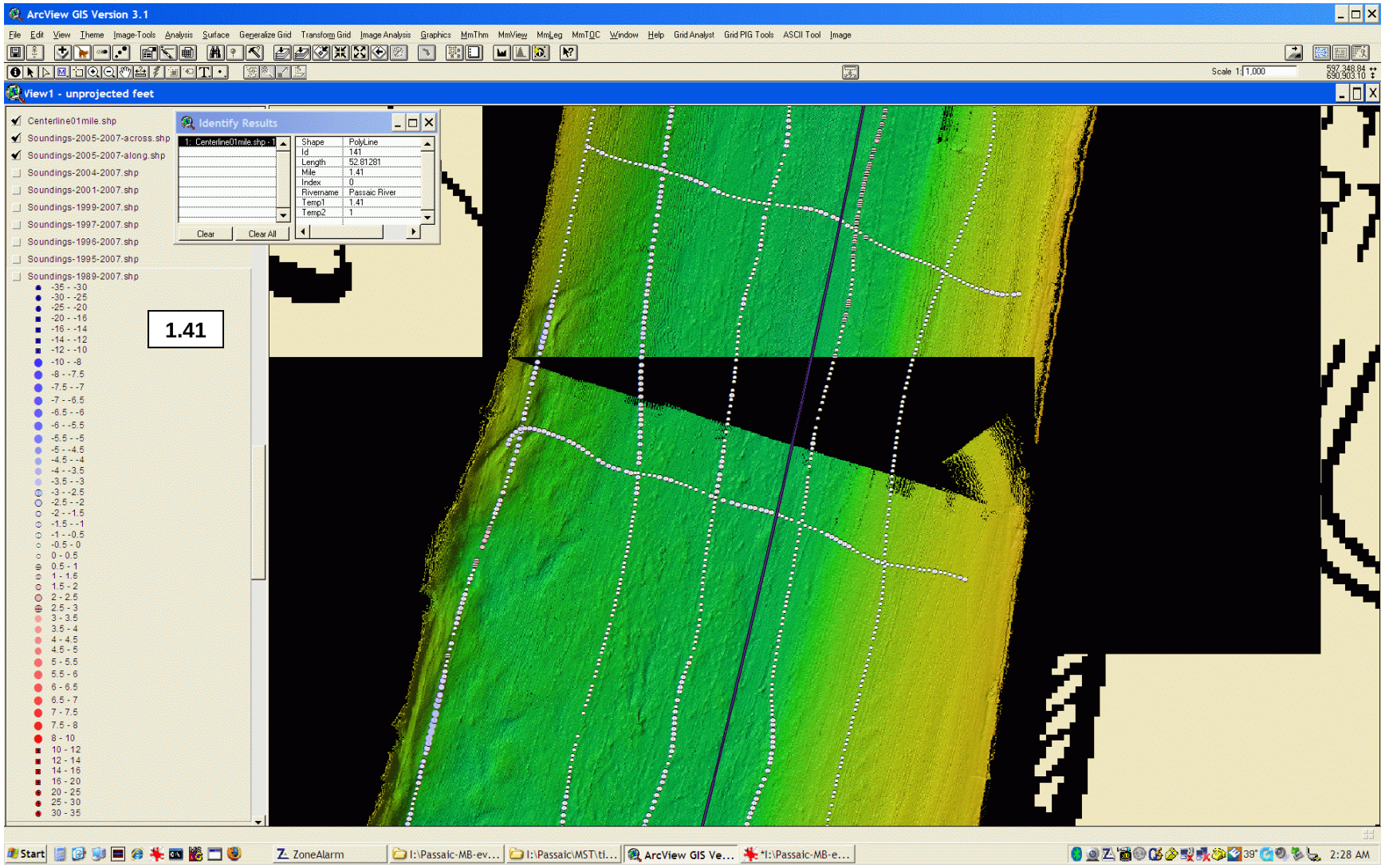
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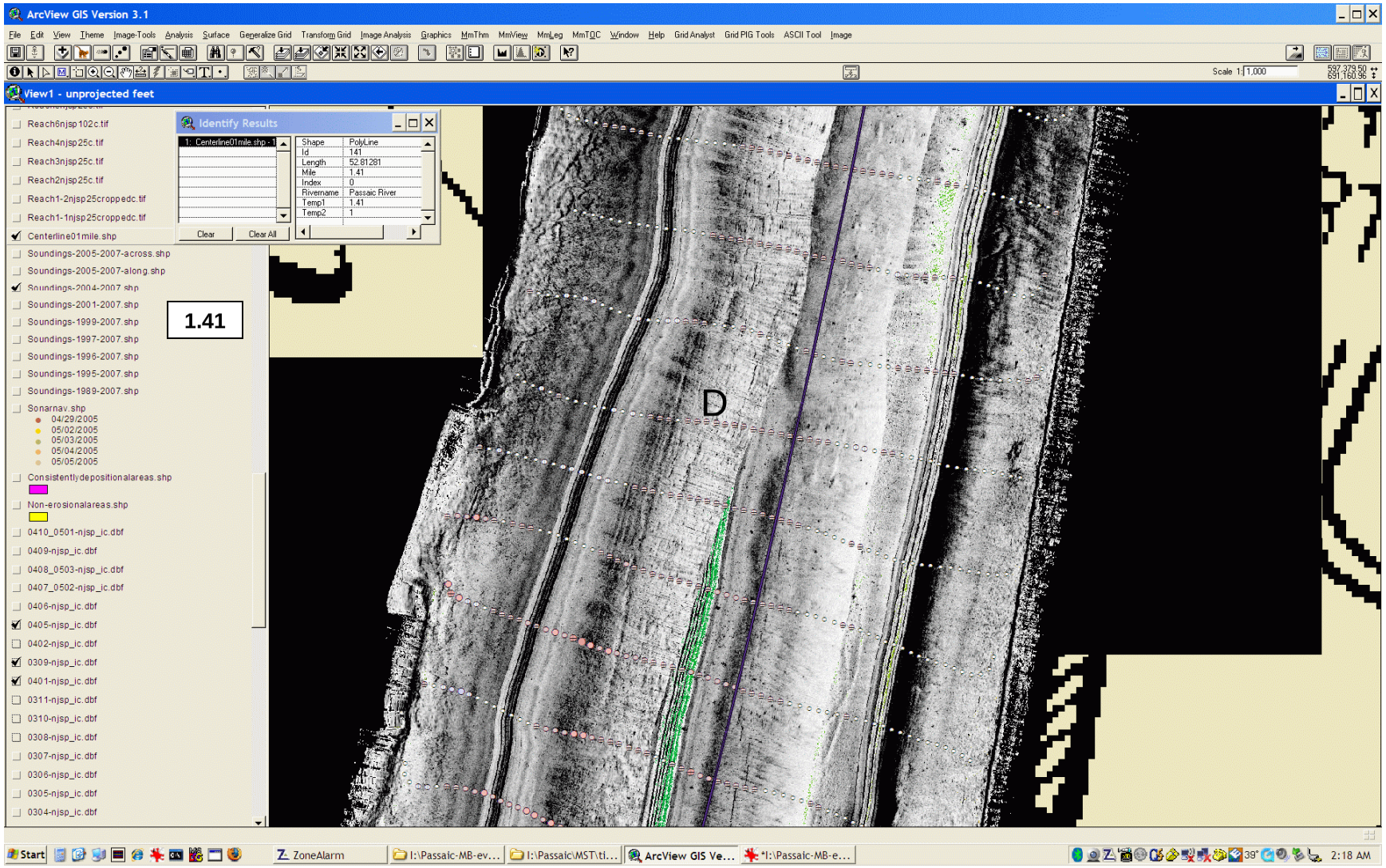
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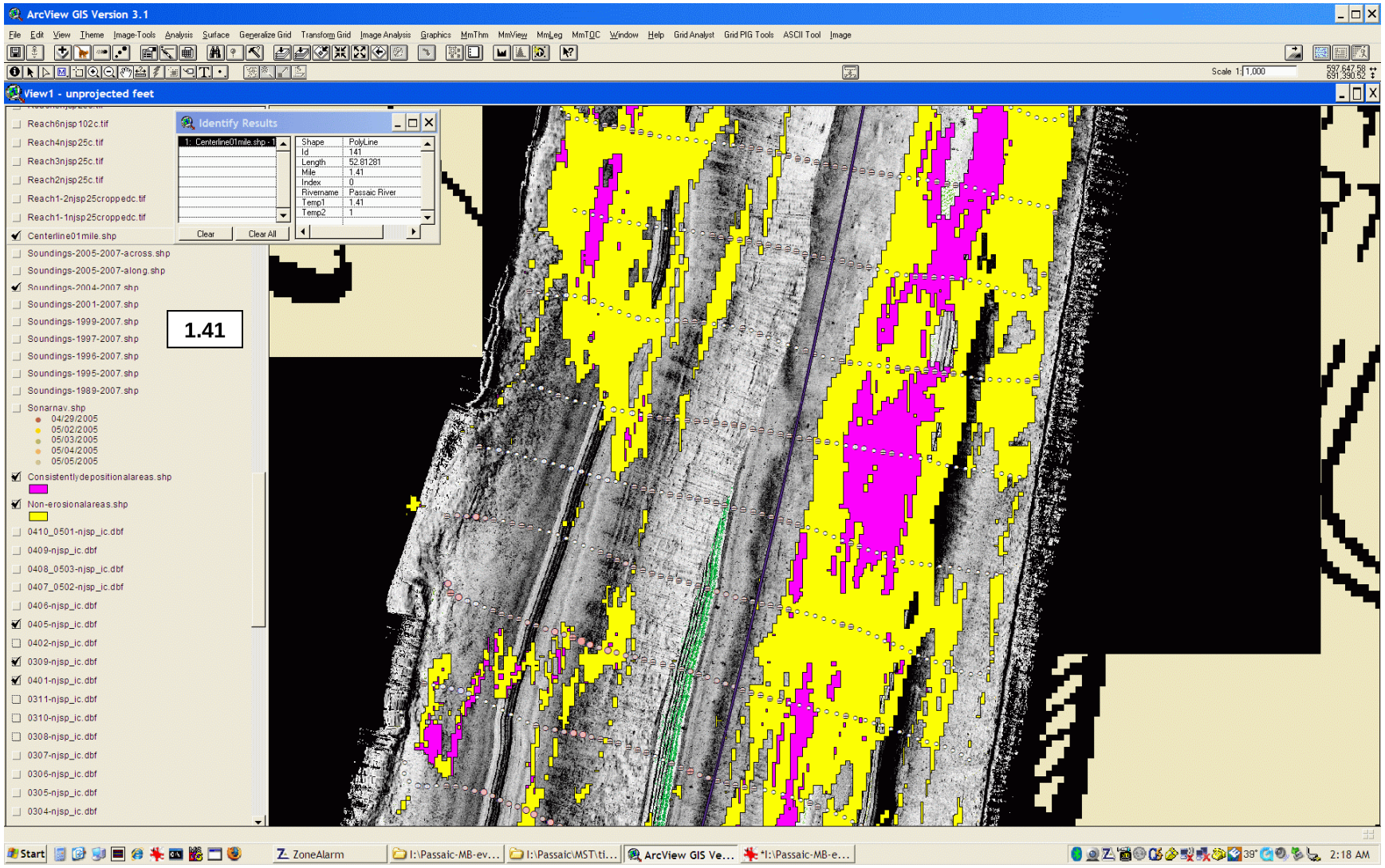
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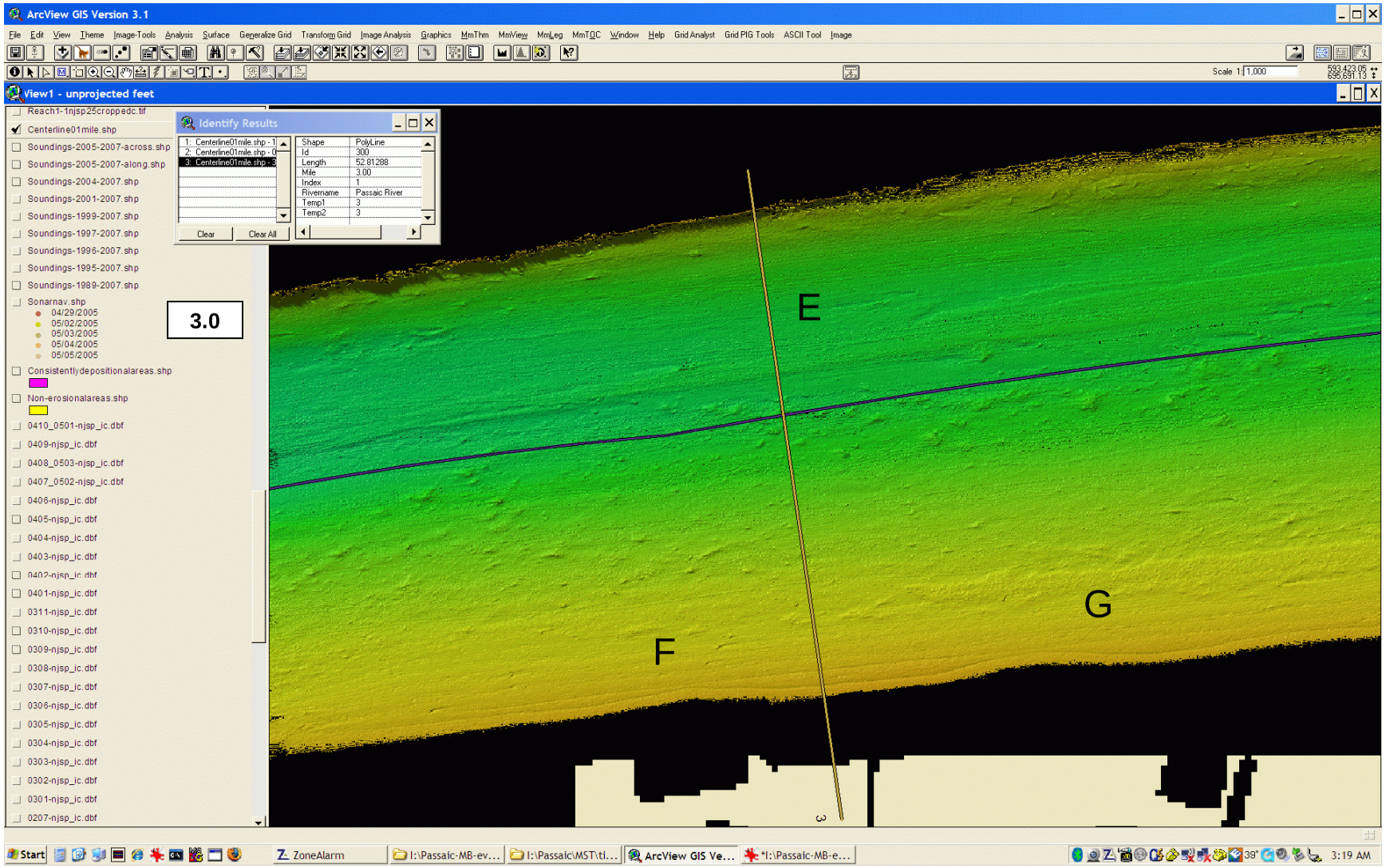
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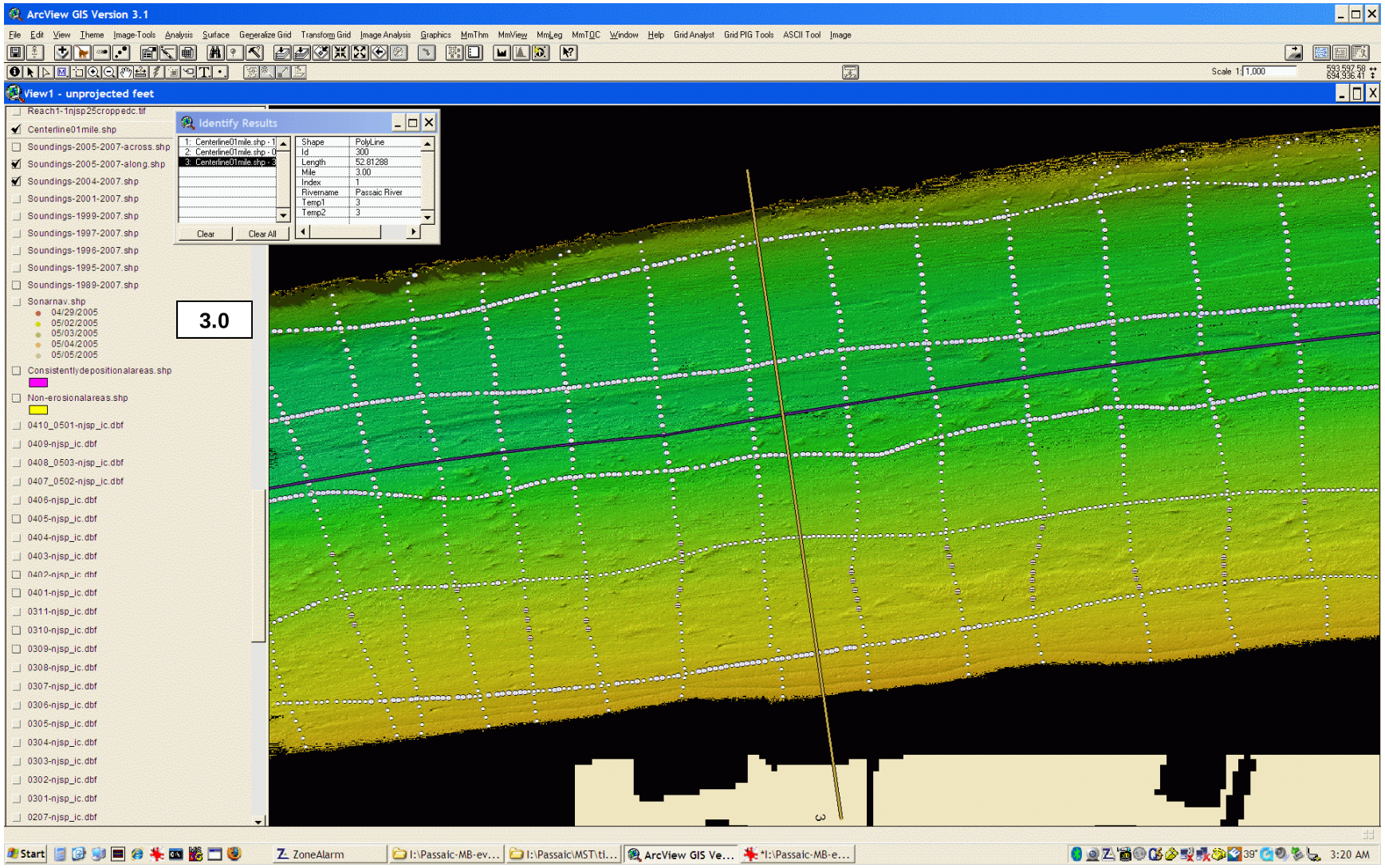
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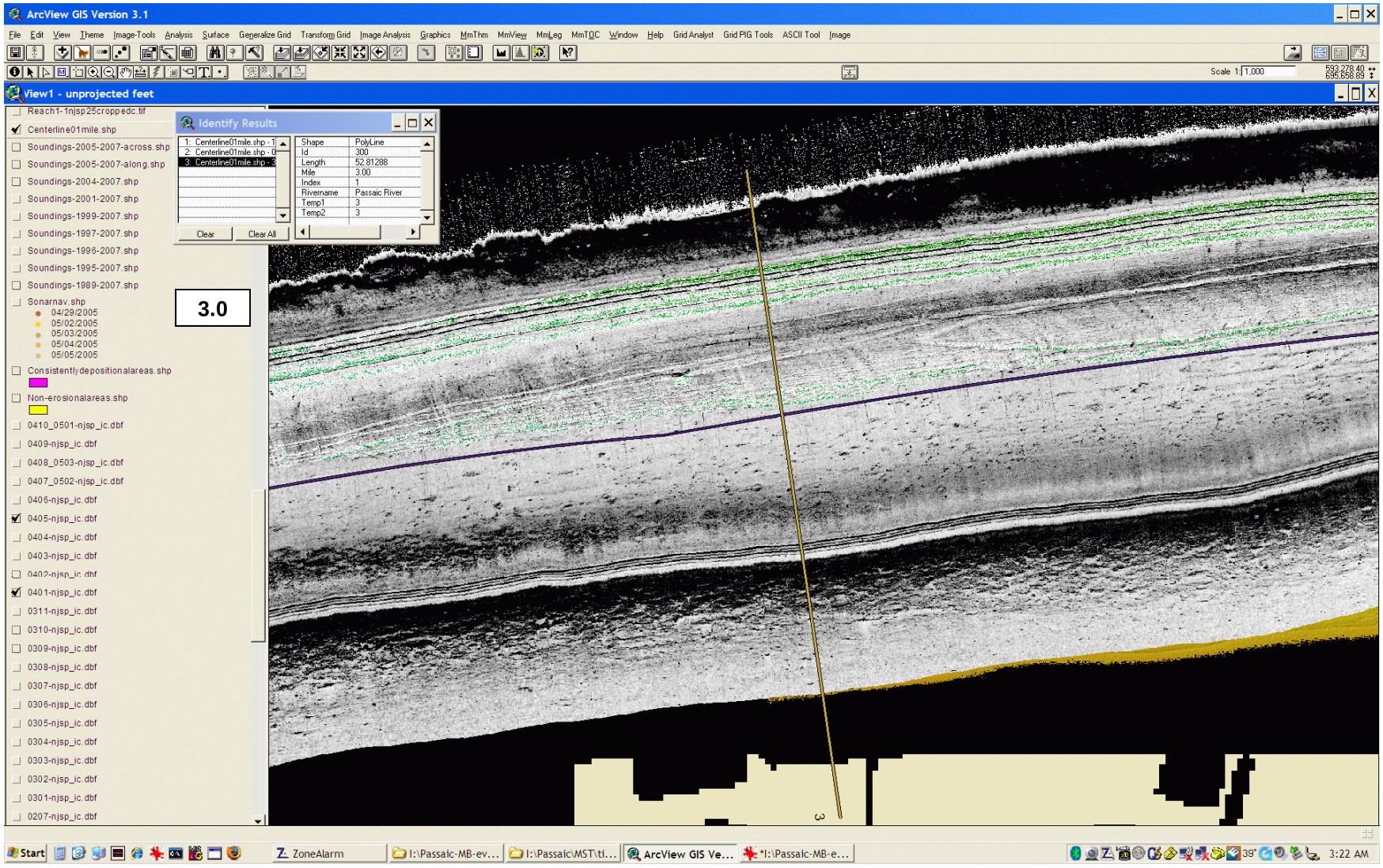
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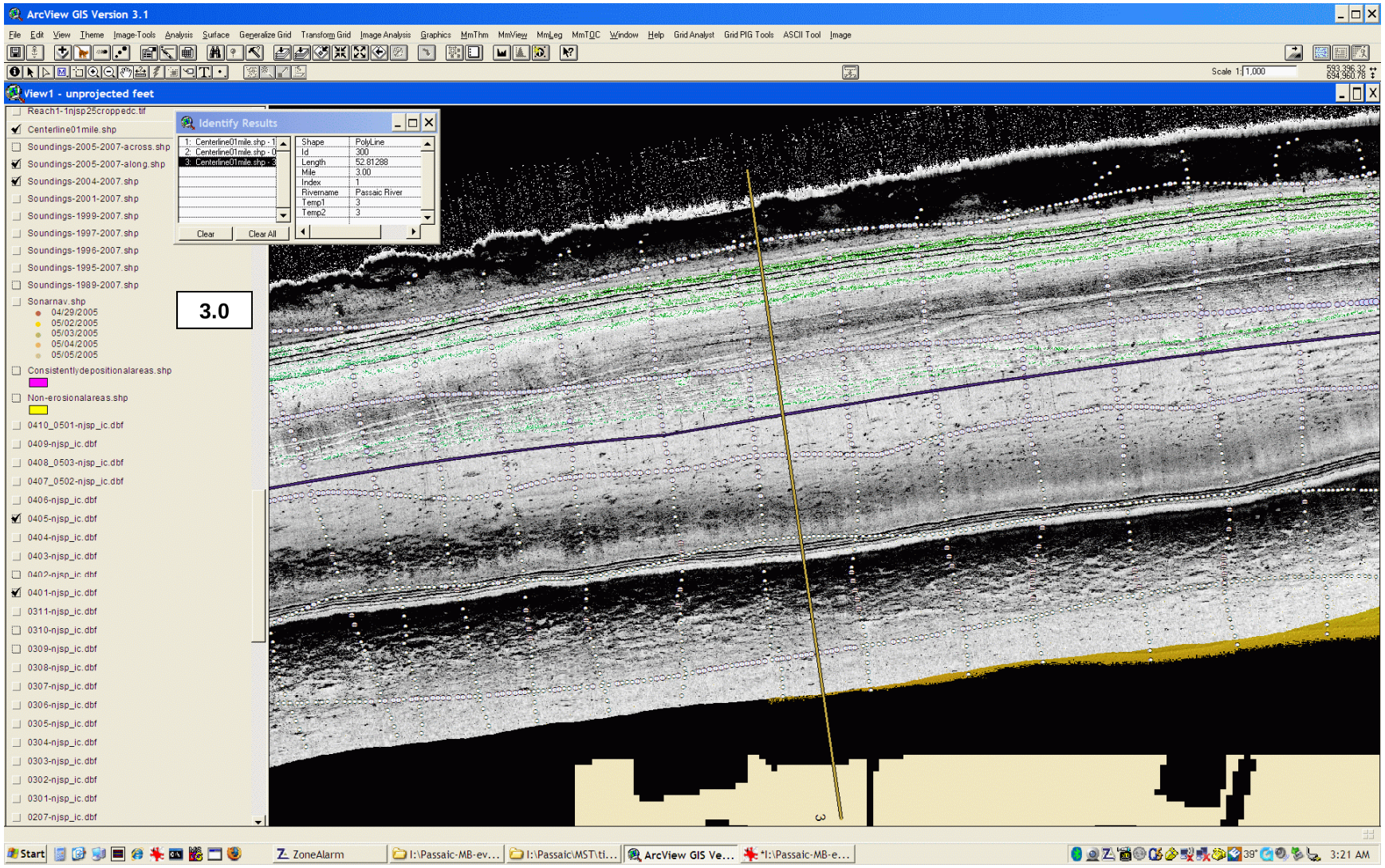
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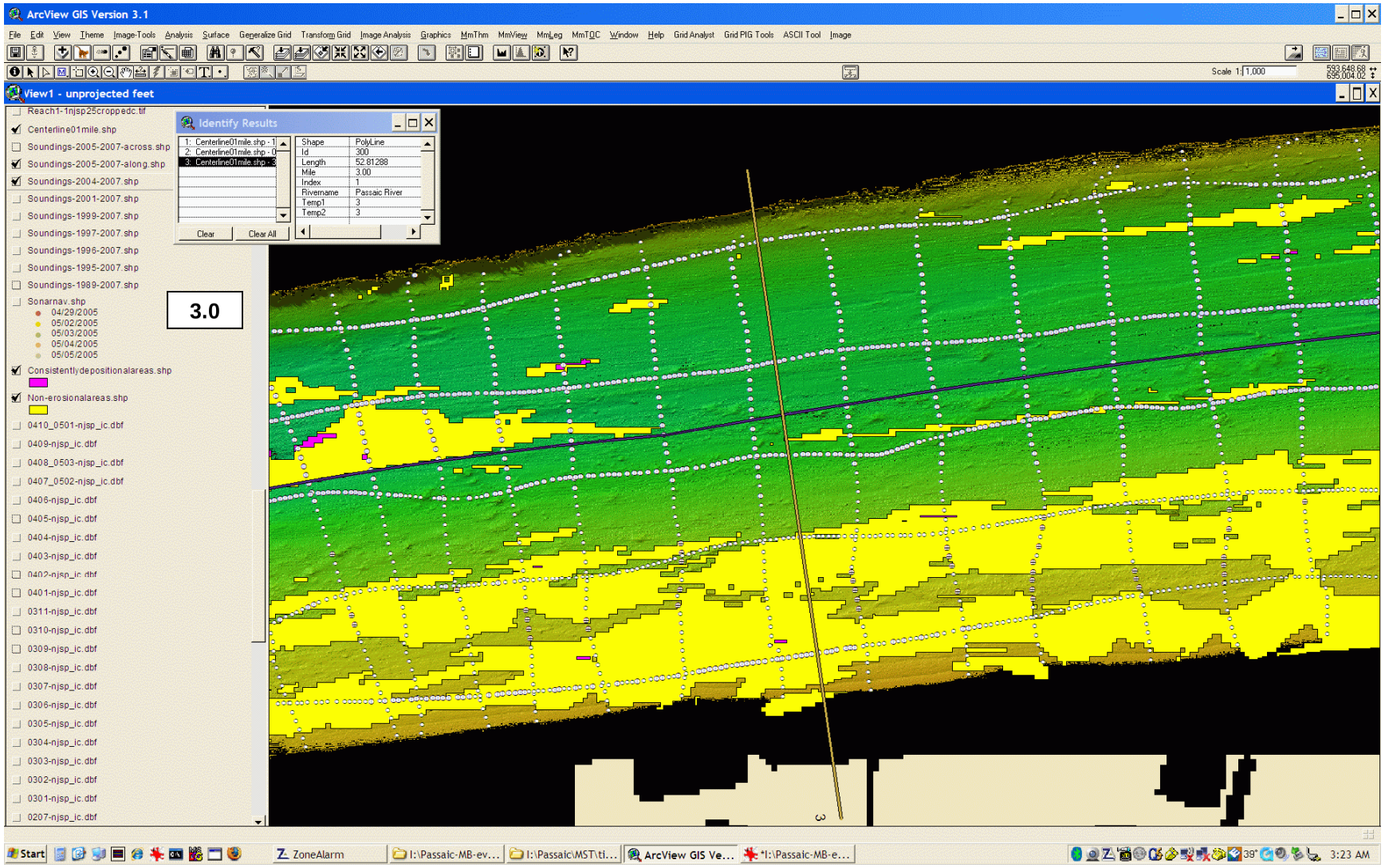
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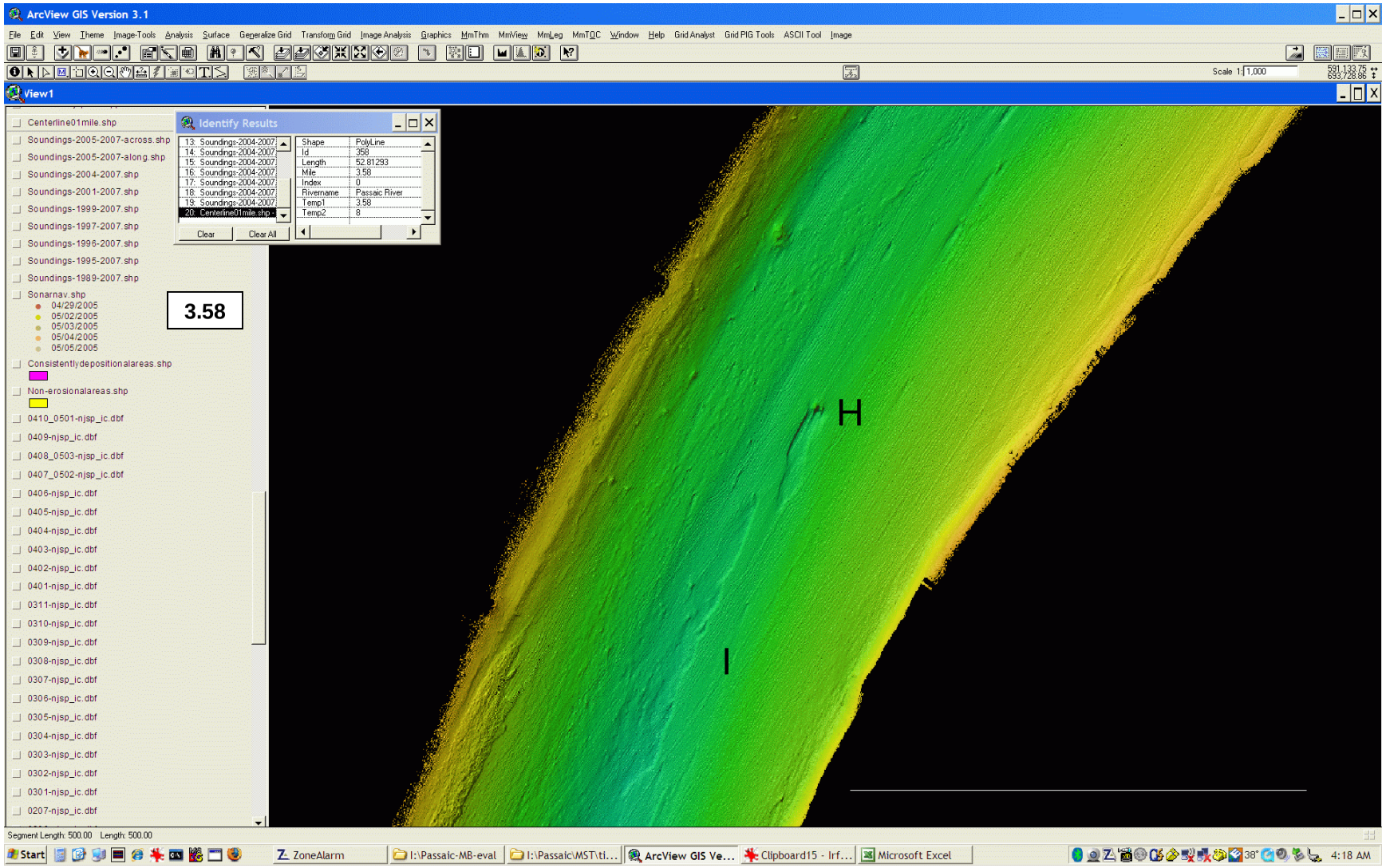
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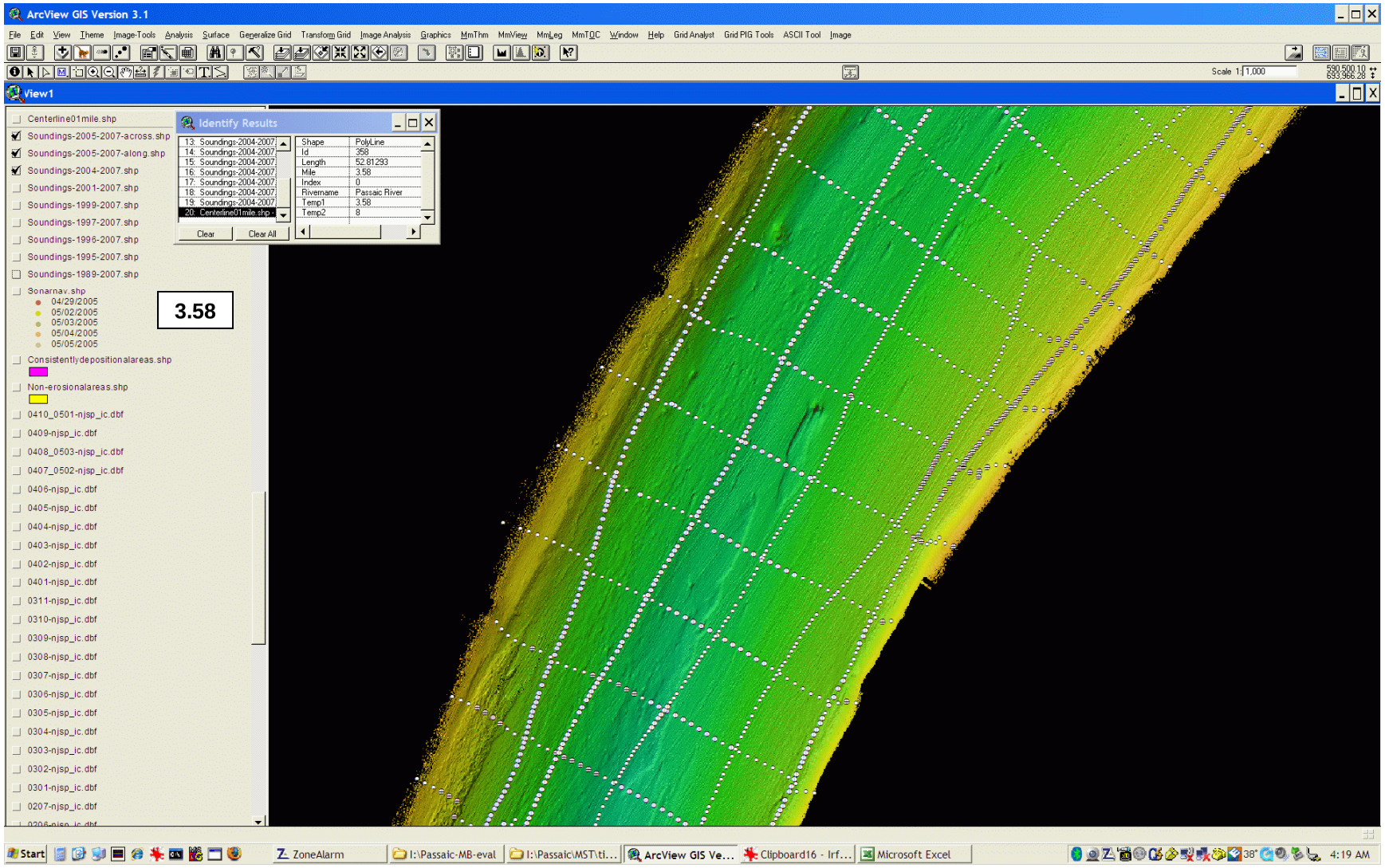
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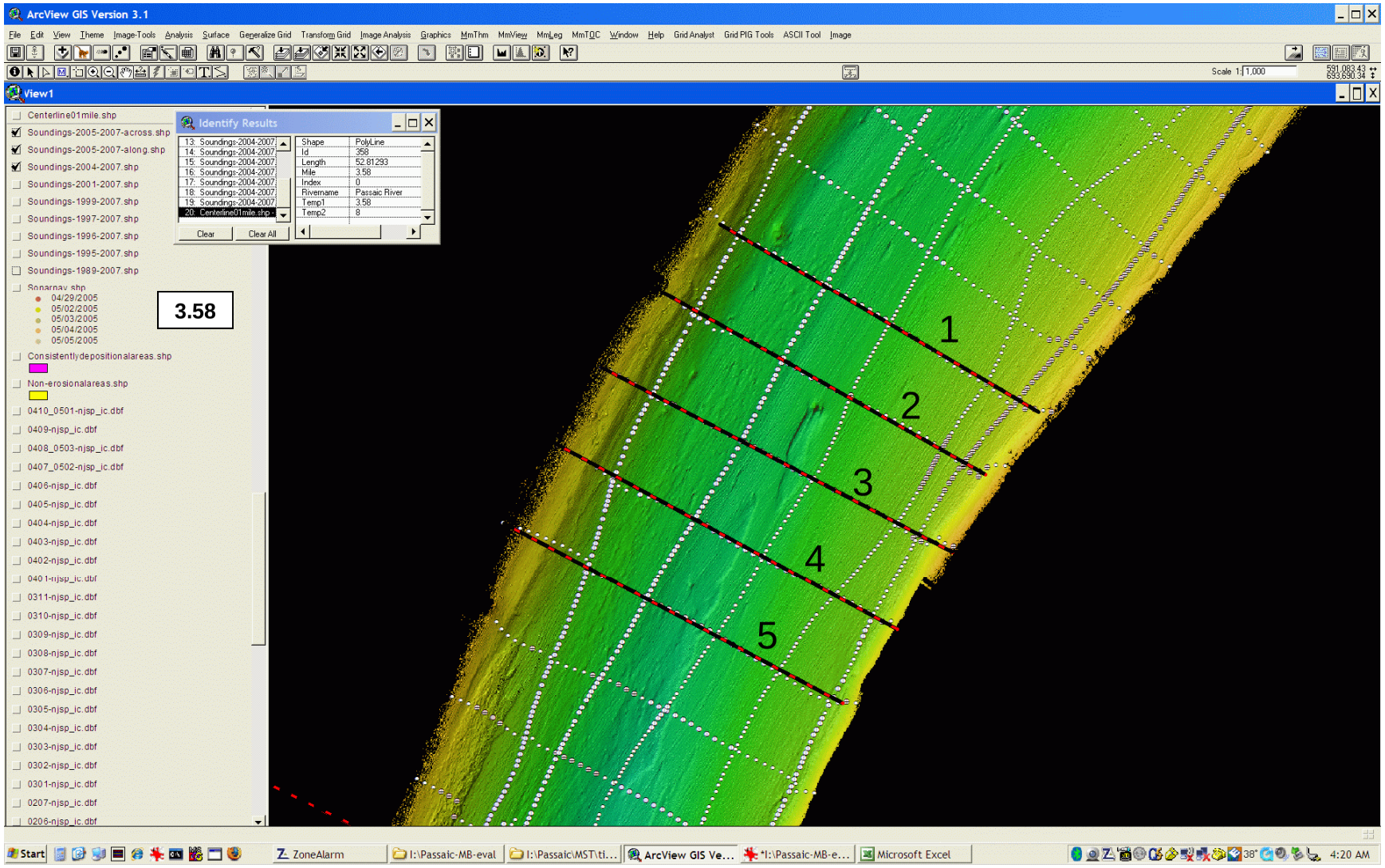


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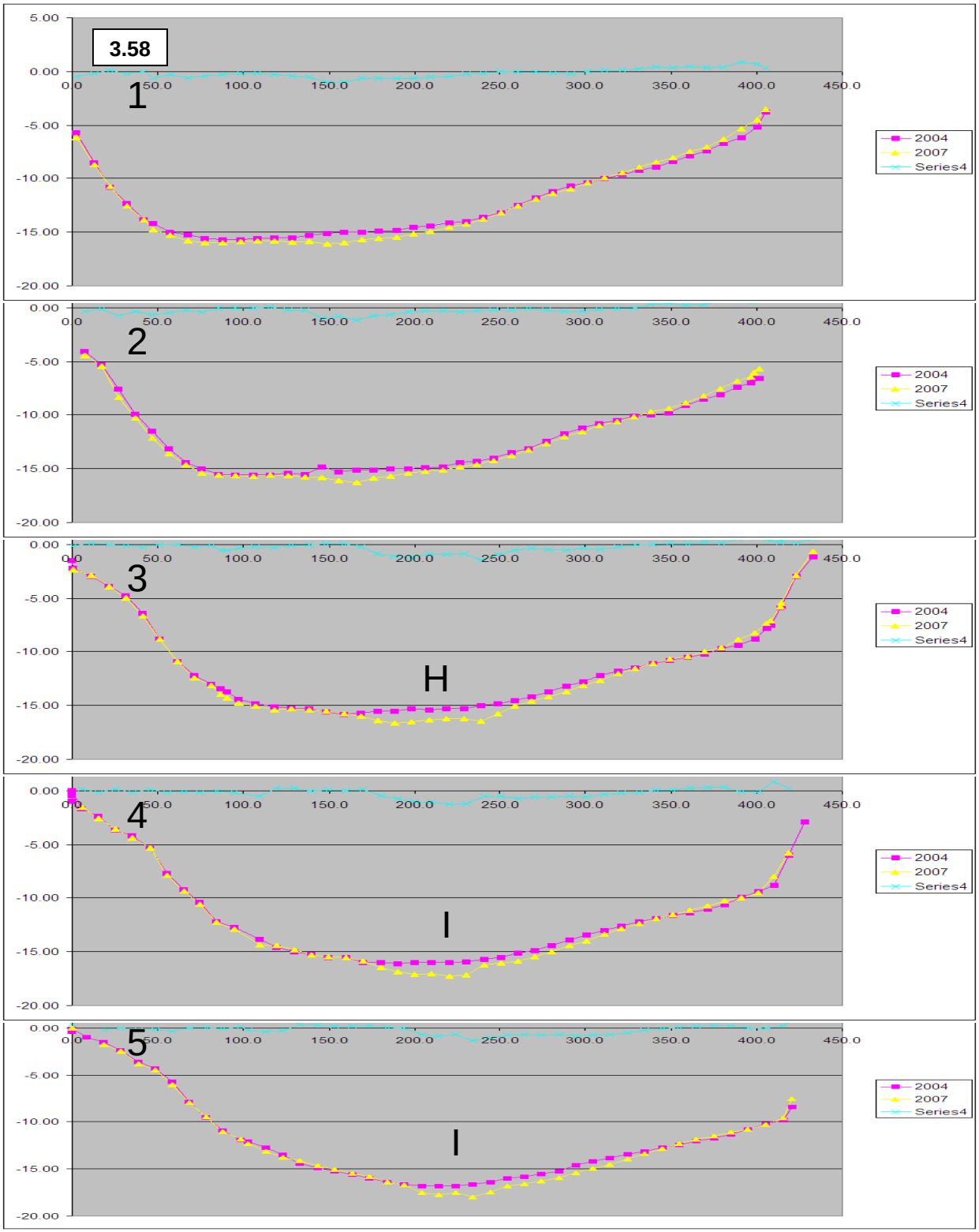
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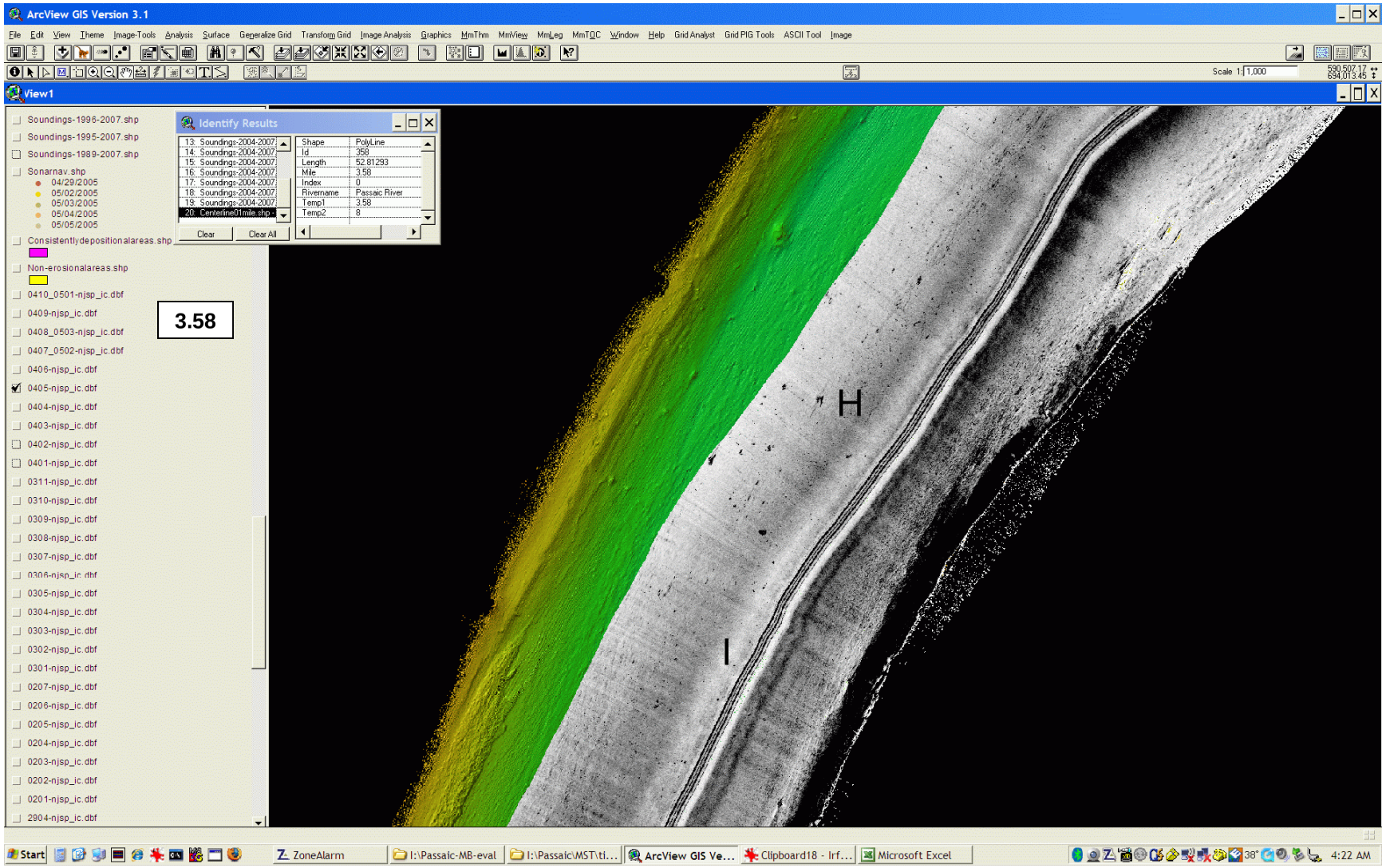
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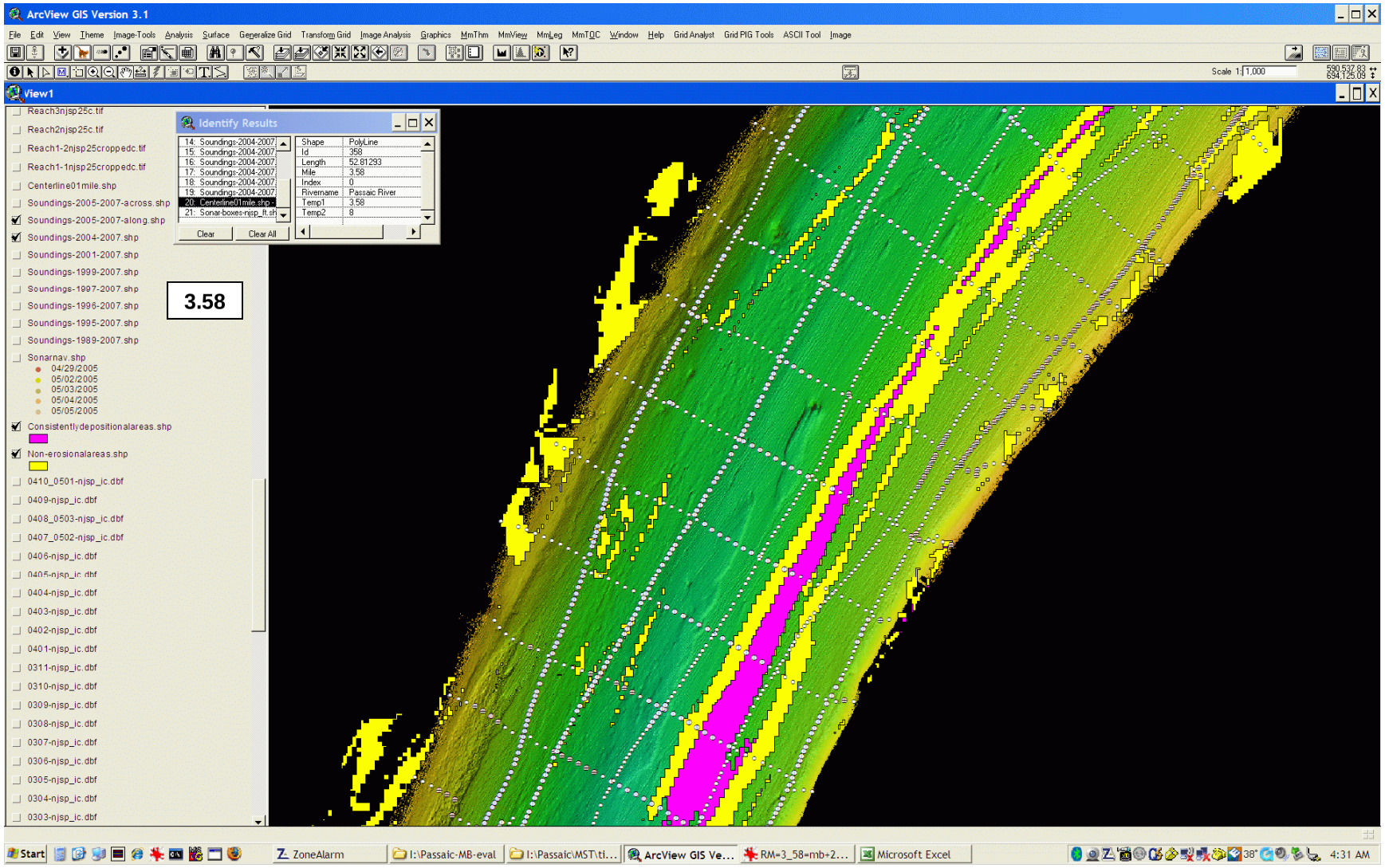
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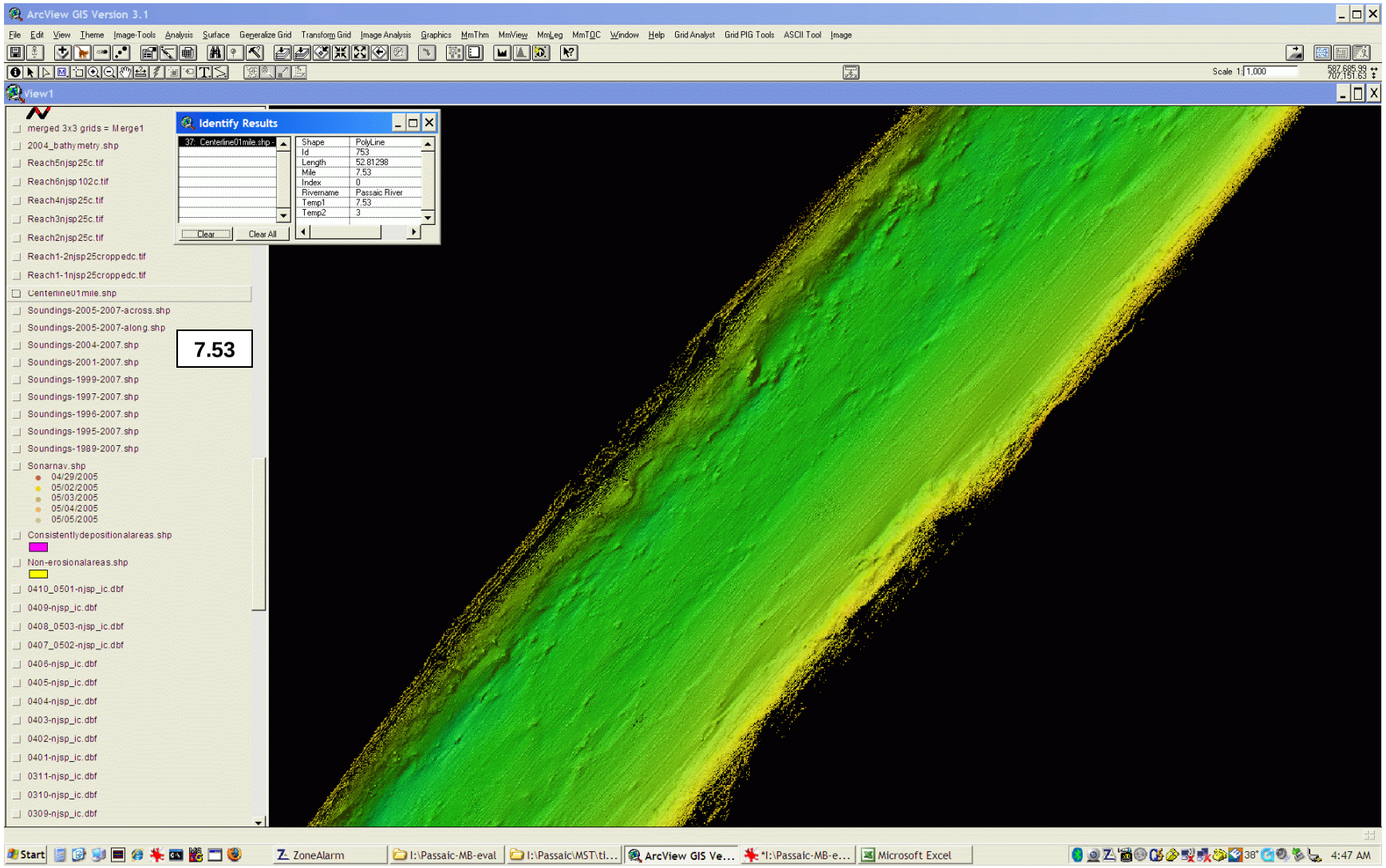
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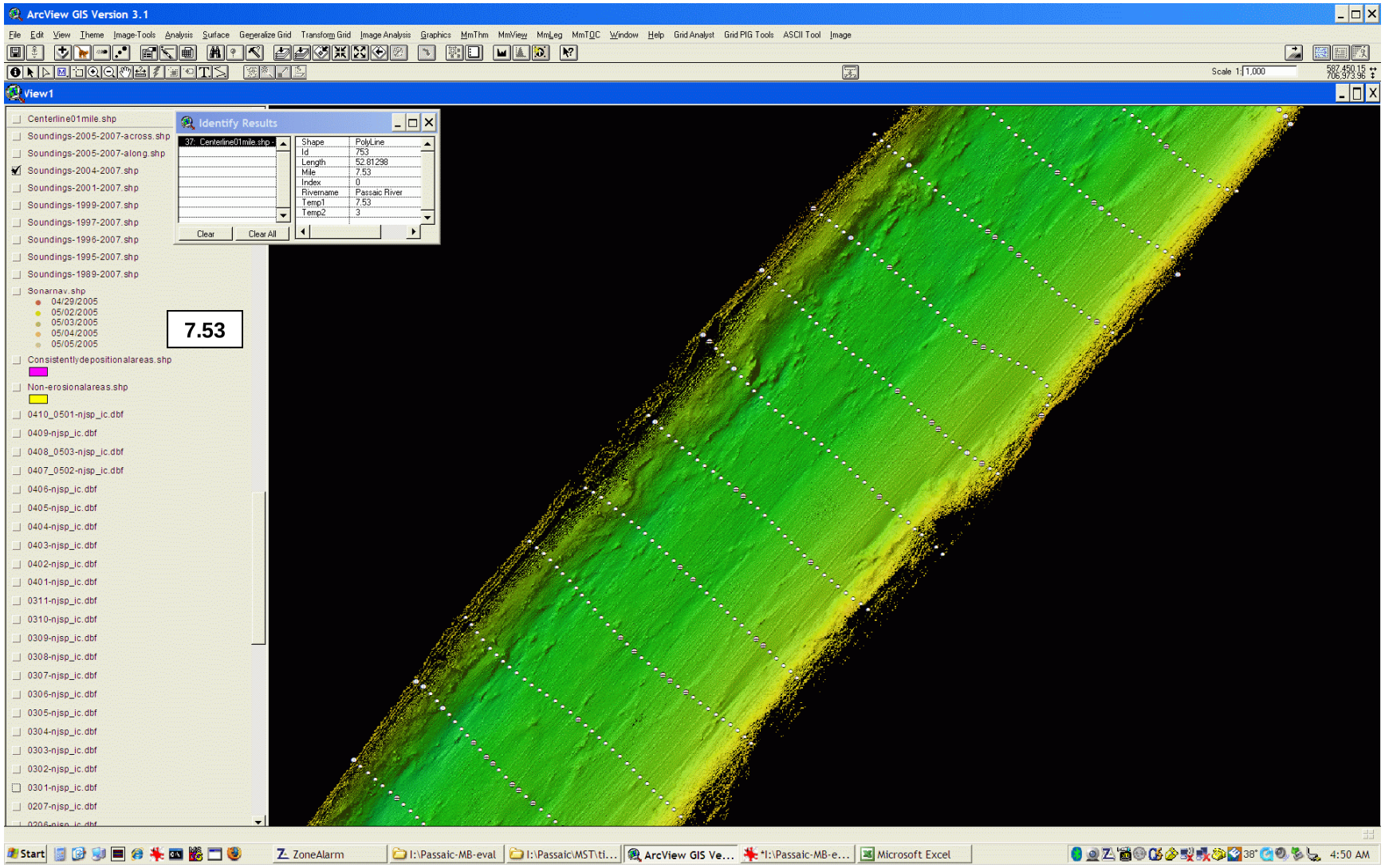
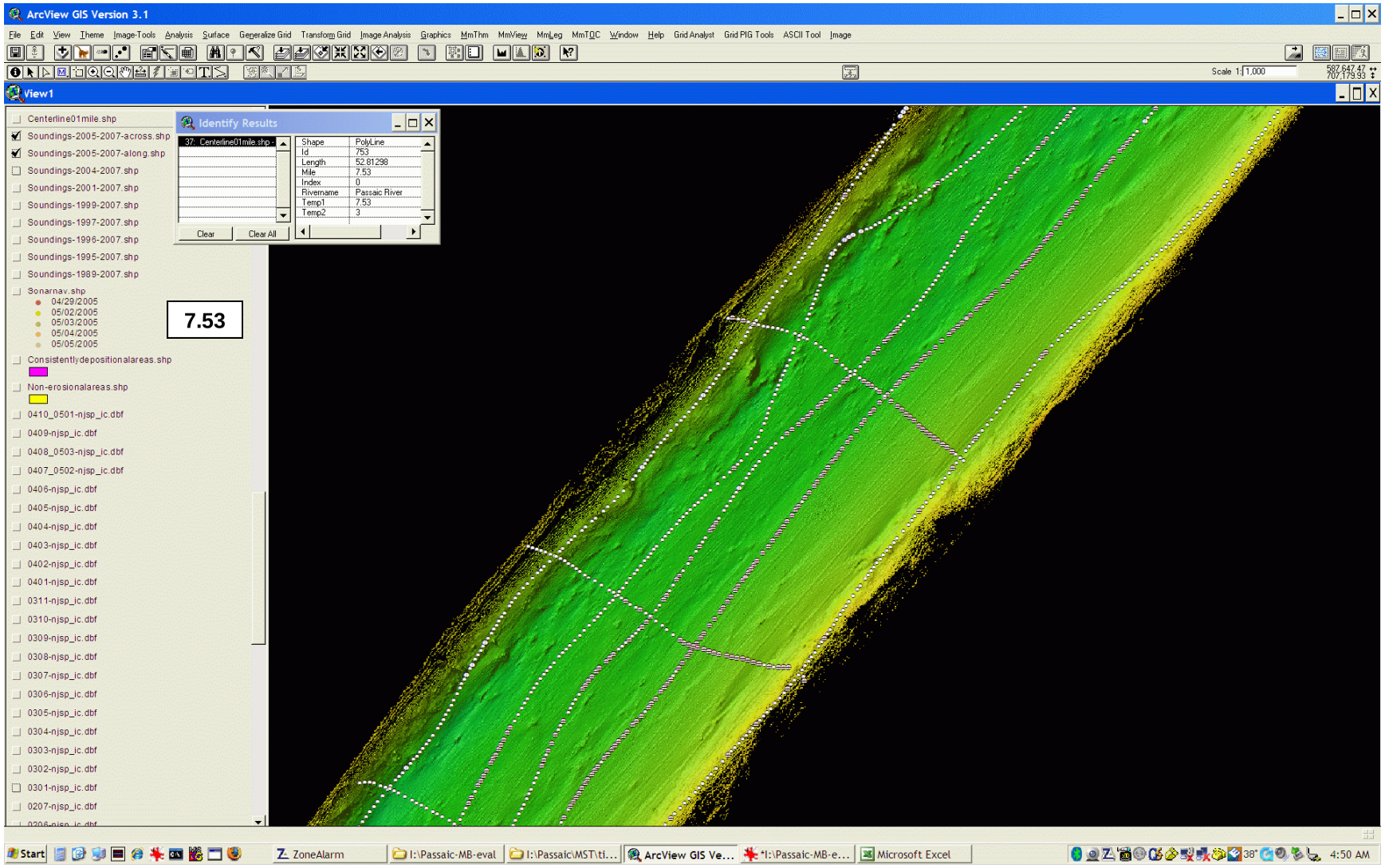
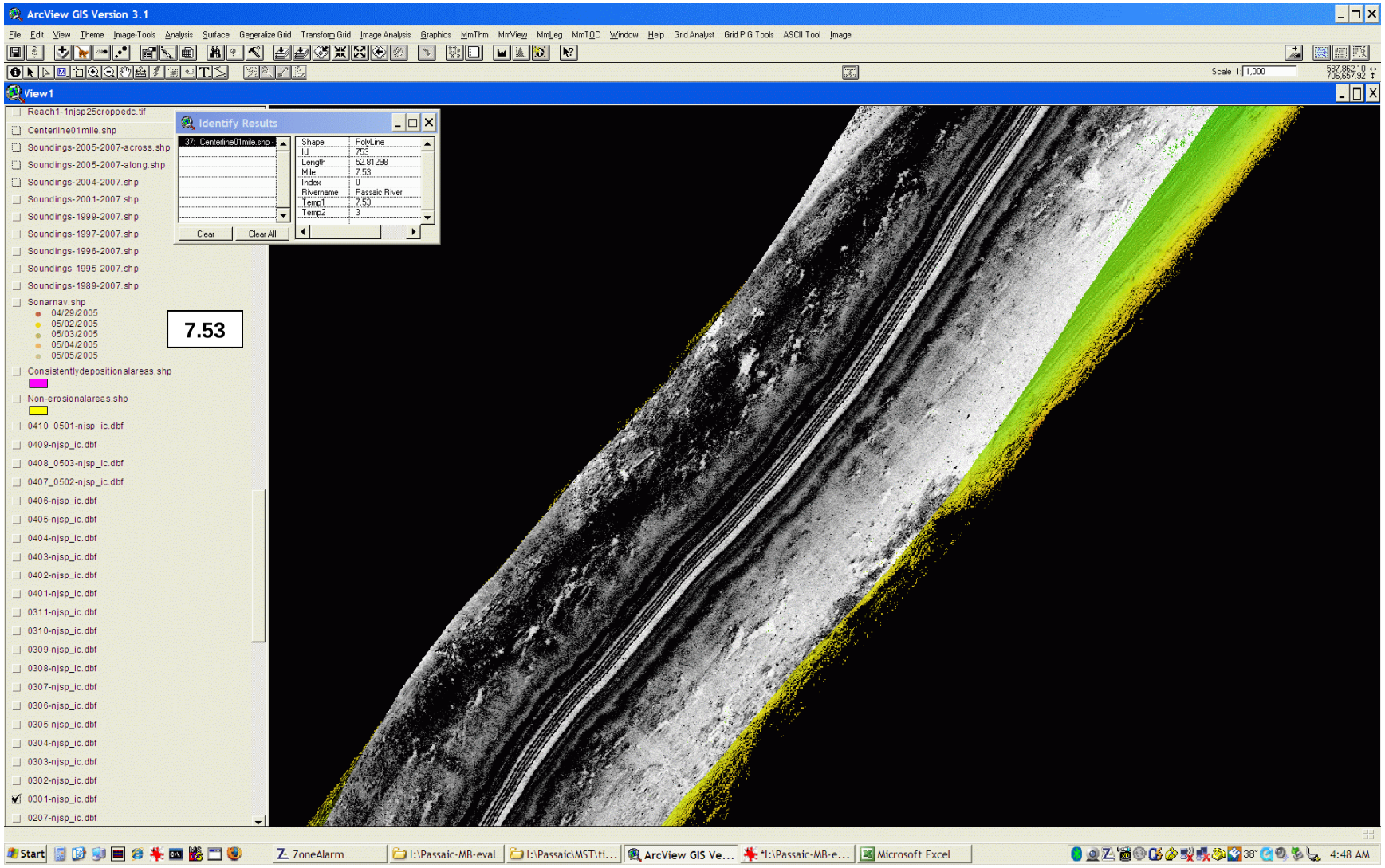
Index 0
Rivername Passaic River
Temp1 7.53
Temp2 3
Clear
Clear All
merged 3x3 grids = Merge1
2004_bathymetry.shp
Reach5njsp25c.tif
Reach6njsp102c.tif
Reach4njsp25c.tif
Reach3njsp25c.tif
Reach2njsp25c.tif
Reach1-2njsp25croppedc.tif
Reach1-1njsp25croppedc.tif
Centerline01mile.shp
Soundings-2005-2007-across.shp
Soundings-2005-2007-along.shp
Soundings-2004-2007.shp
Soundings-2001-2007.shp
Soundings-1999-2007.shp
Soundings-1997-2007.shp
Soundings-1996-2007.shp
Soundings-1995-2007.shp
Soundings-1989-2007.shp
Sonarnav.shp
04/29/2005
05/02/2005
05/03/2005
05/04/2005
05/05/2005
Consistentlydepositionalareas.shp
Non-erosionalareas.shp
0410_0501-njsp_ic.dbf
0409-njsp_ic.dbf
0408_0503-njsp_ic.dbf
0407_0502-njsp_ic.dbf
0406-njsp_ic.dbf
0405-njsp_ic.dbf
0404-njsp_ic.dbf
0403-njsp_ic.dbf
0402-njsp_ic.dbf
0401-njsp_ic.dbf
0311-njsp_ic.dbf
0310-njsp_ic.dbf
0309-njsp_ic.dbf
7.53
Start
ZoneAlarm
I:\Passaic-MB-eval
I:\Passaic\MST\ti...
ArcView GIS Ve...
*I:\Passaic-MB-e...
Microsoft Excel
4:47 AM

400 ft

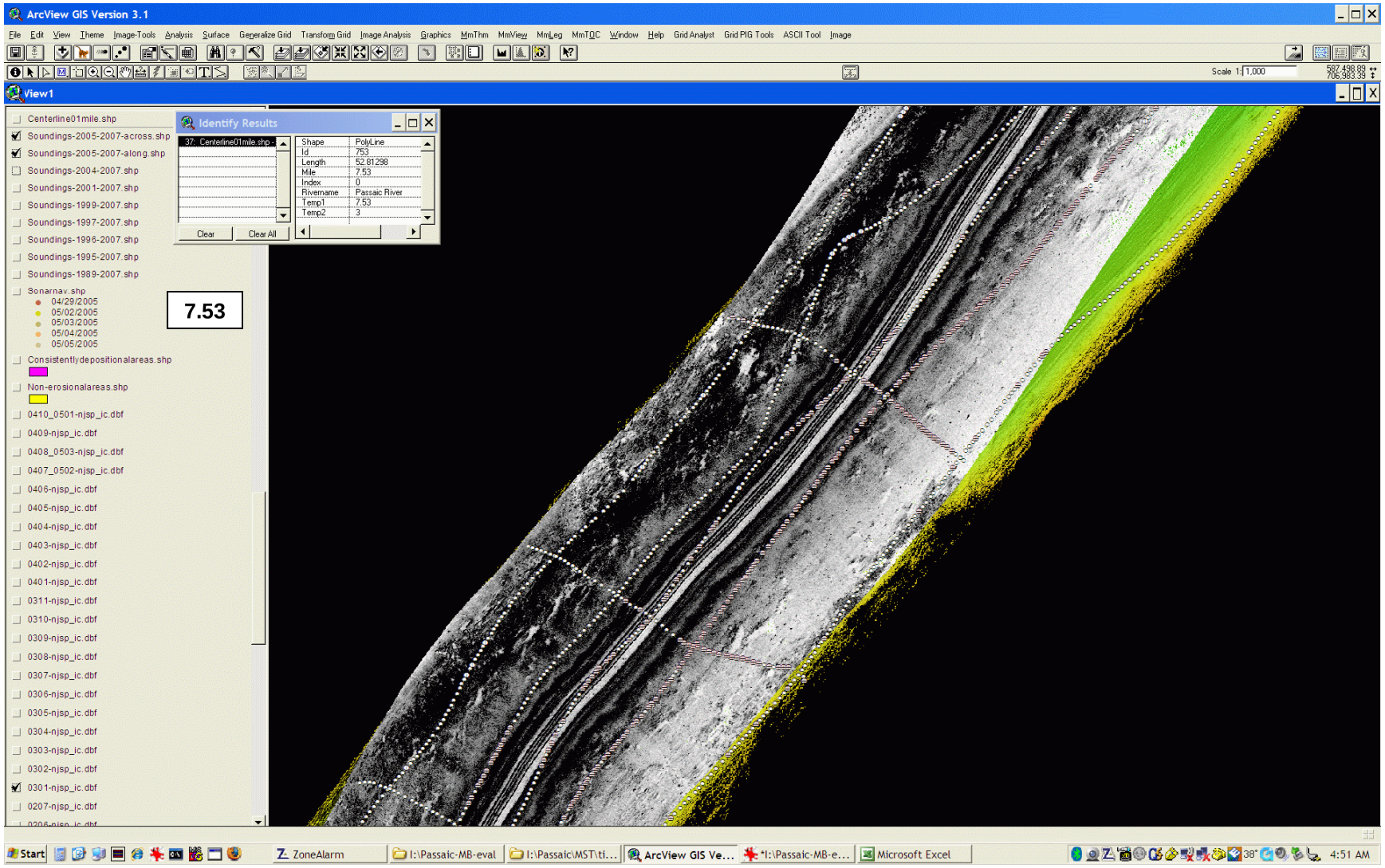

ArcView GIS Version 3.1
View1
Identify Results
7.53
400 ft

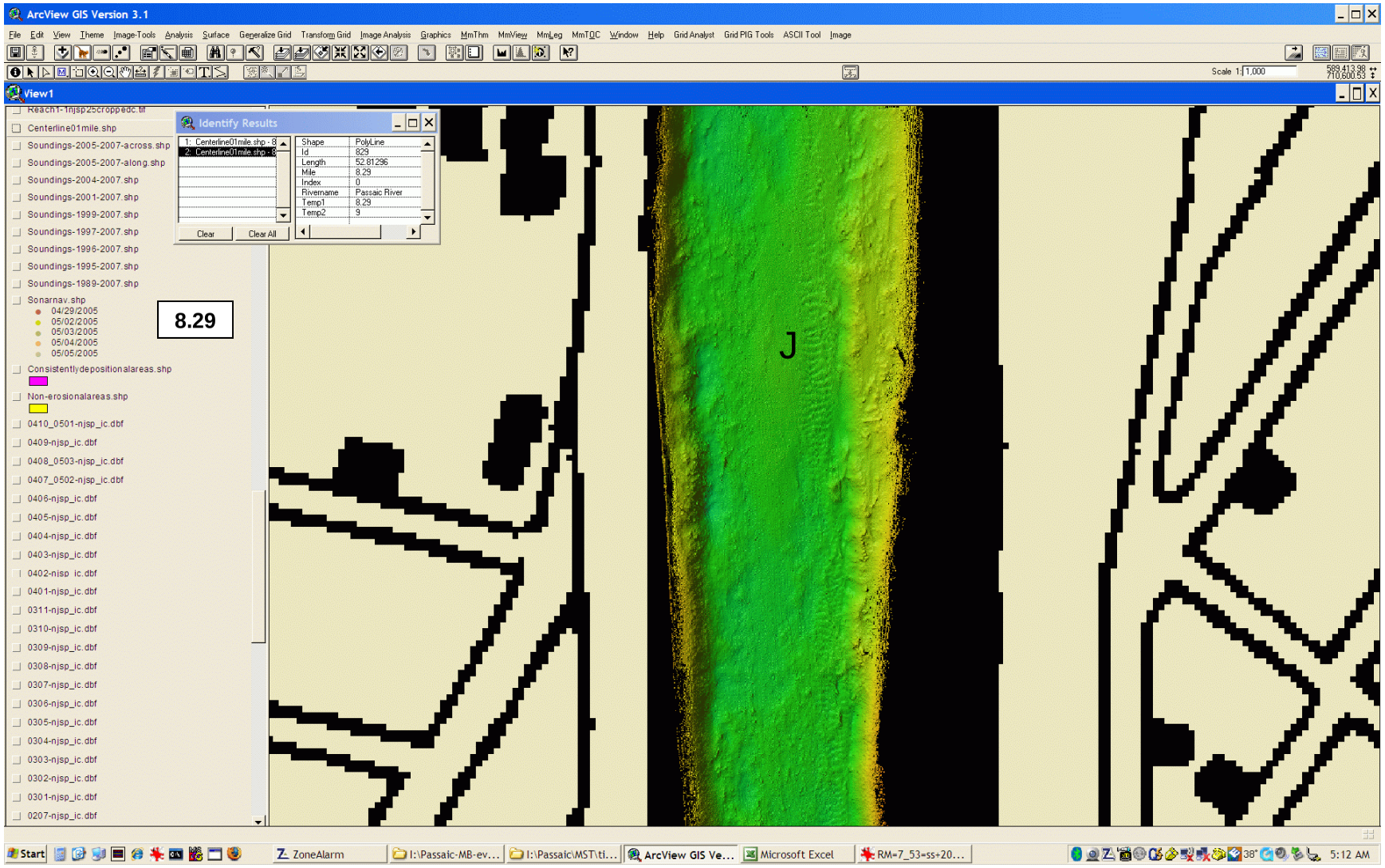

ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
Shape PolyLine
Id 753
Length 52.81298
Mile 7.53
Index 0
Rivername Passaic River
Temp1 7.53
Temp2 3
Clear
Clear All
Centerline01mile.shp
Soundings-2005-2007-across.shp
Soundings-2005-2007-along.shp
Soundings-2004-2007.shp
Soundings-2001-2007.shp
Soundings-1999-2007.shp
Soundings-1997-2007.shp
Soundings-1996-2007.shp
Soundings-1995-2007.shp
Soundings-1989-2007.shp
Sonarnav.shp
04/29/2005
05/02/2005
05/03/2005
05/04/2005
05/05/2005
Consistentlydepositionalareas.shp
Non-erosionalareas.shp
0410_0501-njsp_ic.dbf
0409-njsp_ic.dbf
0408_0503-njsp_ic.dbf
0407_0502-njsp_ic.dbf
0406-njsp_ic.dbf
0405-njsp_ic.dbf
0404-njsp_ic.dbf
0403-njsp_ic.dbf
0402-njsp_ic.dbf
0401-njsp_ic.dbf
0311-njsp_ic.dbf
0310-njsp_ic.dbf
0309-njsp_ic.dbf
0308-njsp_ic.dbf
0307-njsp_ic.dbf
0306-njsp_ic.dbf
0305-njsp_ic.dbf
0304-njsp_ic.dbf
0303-njsp_ic.dbf
0302-njsp_ic.dbf
0301-njsp_ic.dbf
0207-njsp_ic.dbf
7.53
Start
ZoneAlarm
I:\Passaic-MB-eval
I:\Passaic\MST\ti...
ArcView GIS Ve...
*I:\Passaic-MB-e...
Microsoft Excel
4:50 AM

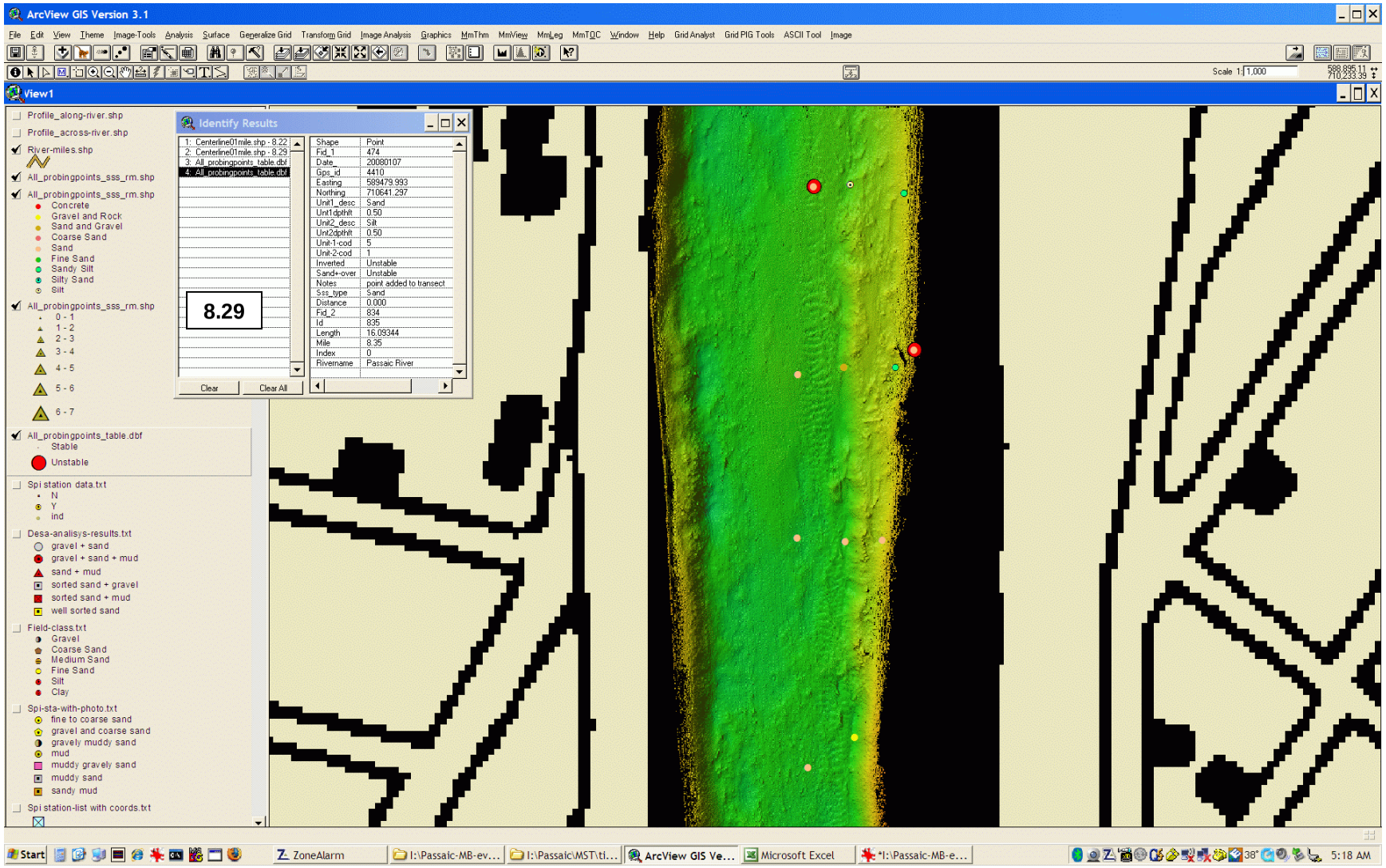
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
37: Centerline01mile.shp
Shape PolyLine
Id 753
Length 52.81298
Mile 7.53
Index 0
Rivername Passaic River
Temp1 7.53
Temp2 3
Clear
Clear All
Reach1-1njsp25croppedc.tif
Centerline01mile.shp
Soundings-2005-2007-across.shp
Soundings-2005-2007-along.shp
Soundings-2004-2007.shp
Soundings-2001-2007.shp
Soundings-1999-2007.shp
Soundings-1997-2007.shp
Soundings-1996-2007.shp
Soundings-1995-2007.shp
Soundings-1989-2007.shp
Sonarnav.shp
04/29/2005
05/02/2005
05/03/2005
05/04/2005
05/05/2005
Consistentlydepositionalareas.shp
Non-erosionalareas.shp
0410_0501-njsp_ic.dbf
0409-njsp_ic.dbf
0408_0503-njsp_ic.dbf
0407_0502-njsp_ic.dbf
0406-njsp_ic.dbf
0405-njsp_ic.dbf
0404-njsp_ic.dbf
0403-njsp_ic.dbf
0402-njsp_ic.dbf
0401-njsp_ic.dbf
0311-njsp_ic.dbf
0310-njsp_ic.dbf
0309-njsp_ic.dbf
0308-njsp_ic.dbf
0307-njsp_ic.dbf
0306-njsp_ic.dbf
0305-njsp_ic.dbf
0304-njsp_ic.dbf
0303-njsp_ic.dbf
0302-njsp_ic.dbf
0301-njsp_ic.dbf
0207-njsp_ic.dbf
7.53
Start
ZoneAlarm
I:\Passaic-MB-eval
I:\Passaic\MST\ti...
ArcView GIS Ve...
*I:\Passaic-MB-e...
Microsoft Excel
4:48 AM

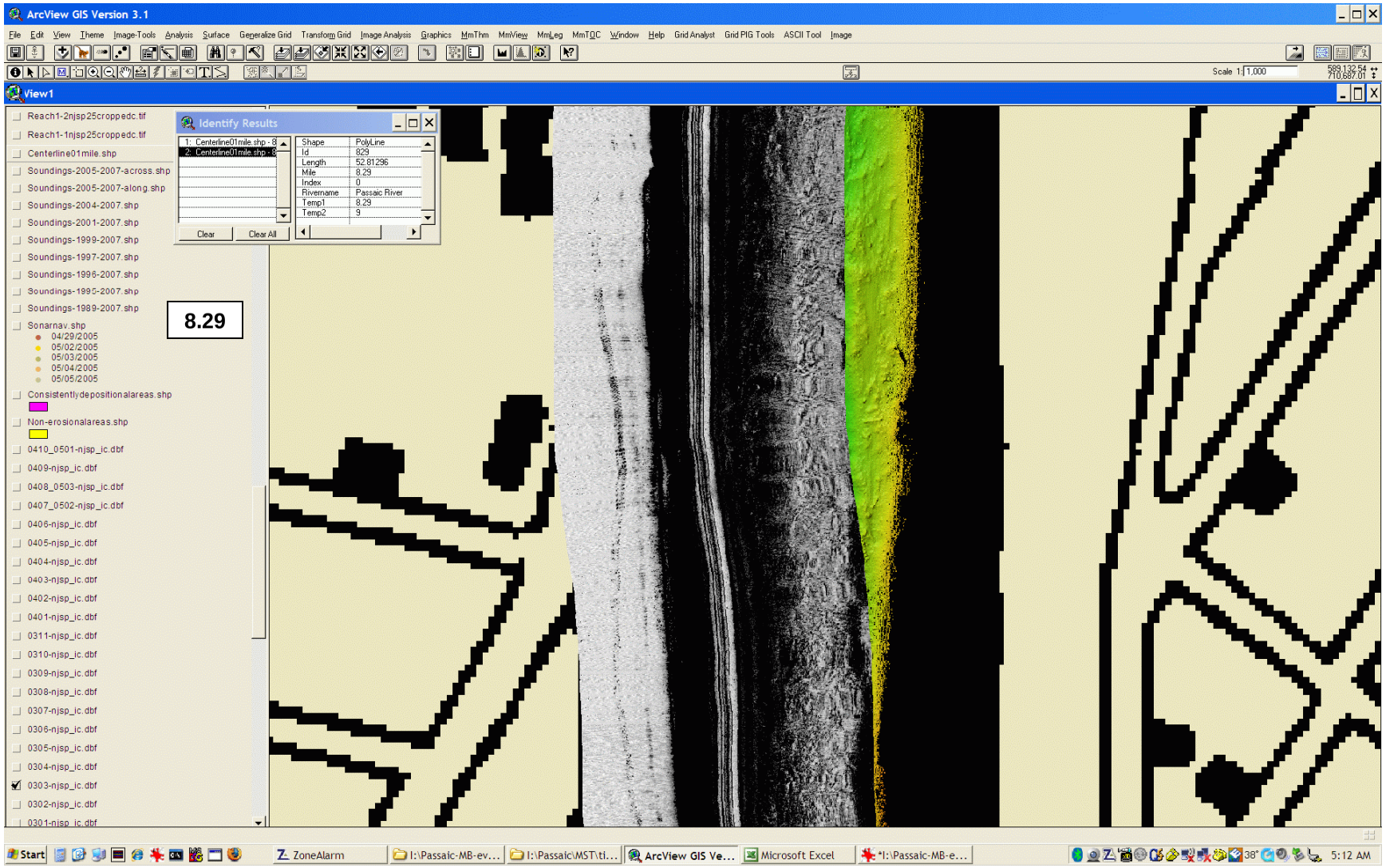
400 ft


ArcView GIS Version 3.1
View1
Identify Results
7.53
400 ft

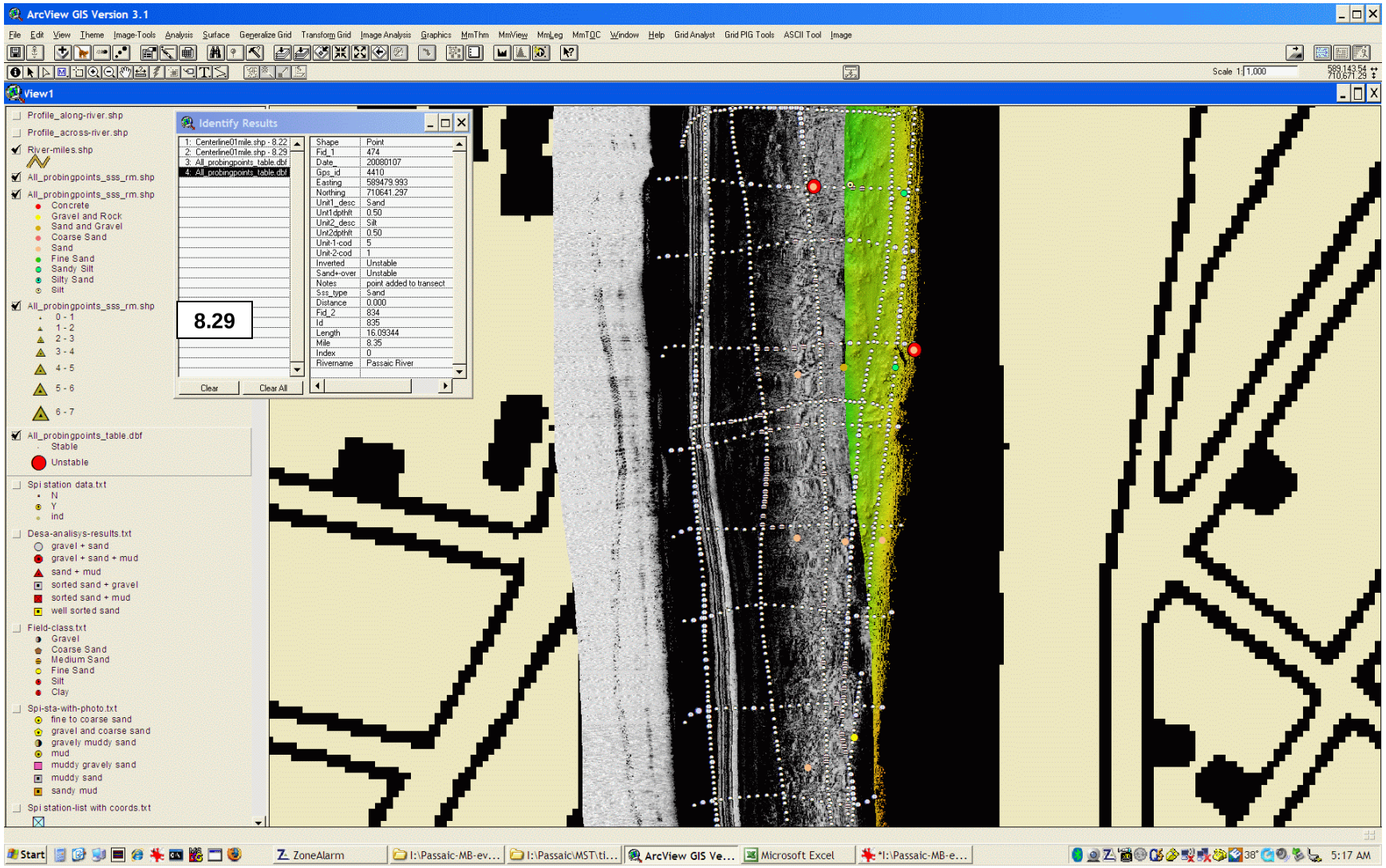

ArcView GIS Version 3.1
View1
Identify Results
8.29
J
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
8.29
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
Desa-analisys-results.txt
Field-class.txt
Spi-sta-with-photo.txt
Spi station-list with coords.txt
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
5:18 AM

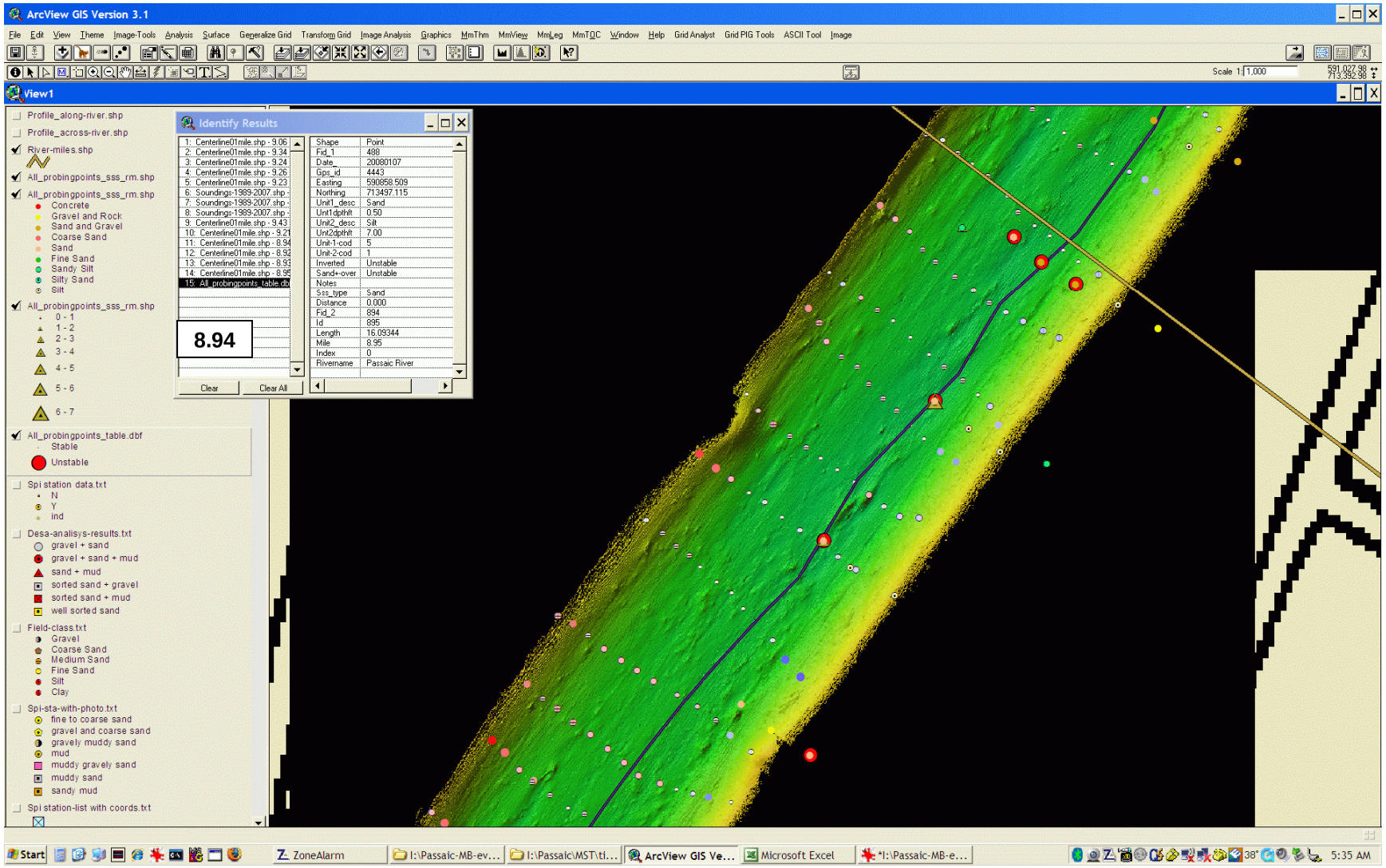
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
Shape PolyLine
Id 929
Length 52.81296
Mile 8.29
Index 0
Rivername Passaic River
Temp1 8.29
Temp2 9
Clear
Clear All
8.29
Reach1-2njsp25croppedc.tif
Reach1-1njsp25croppedc.tif
Centerline01mile.shp
Soundings-2005-2007-across.shp
Soundings-2005-2007-along.shp
Soundings-2004-2007.shp
Soundings-2001-2007.shp
Soundings-1999-2007.shp
Soundings-1997-2007.shp
Soundings-1996-2007.shp
Soundings-1995-2007.shp
Soundings-1989-2007.shp
Sonarnav.shp
04/29/2005
05/02/2005
05/03/2005
05/04/2005
05/05/2005
Consistentlydepositionalareas.shp
Non-erosionalareas.shp
0410_0501-njsp_ic.dbf
0409-njsp_ic.dbf
0408_0503-njsp_ic.dbf
0407_0502-njsp_ic.dbf
0406-njsp_ic.dbf
0405-njsp_ic.dbf
0404-njsp_ic.dbf
0403-njsp_ic.dbf
0402-njsp_ic.dbf
0401-njsp_ic.dbf
0311-njsp_ic.dbf
0310-njsp_ic.dbf
0309-njsp_ic.dbf
0308-njsp_ic.dbf
0307-njsp_ic.dbf
0306-njsp_ic.dbf
0305-njsp_ic.dbf
0304-njsp_ic.dbf
0303-njsp_ic.dbf
0302-njsp_ic.dbf
0301-njsp_ic.dbf
Start
ZoneAlarm
I:\Passaic-MB-ev...
I:\Passaic\MST\ti...
ArcView GIS Ve...
Microsoft Excel
*I:\Passaic-MB-e...
5:12 AM

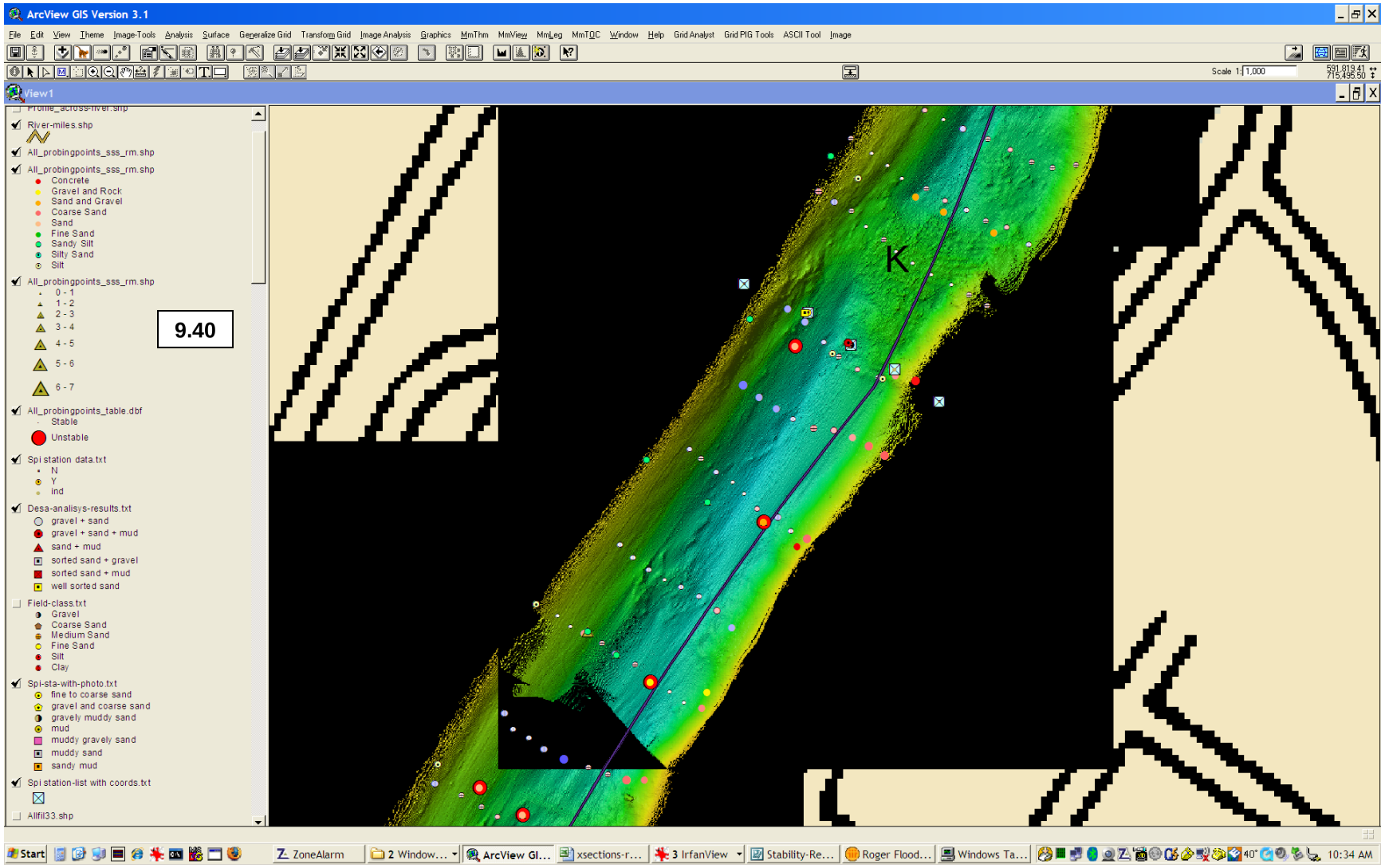
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
8.29
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
Desa-analisys-results.txt
Field-class.txt
Spi-sta-with-photo.txt
Spi station-list with coords.txt
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
5:17 AM

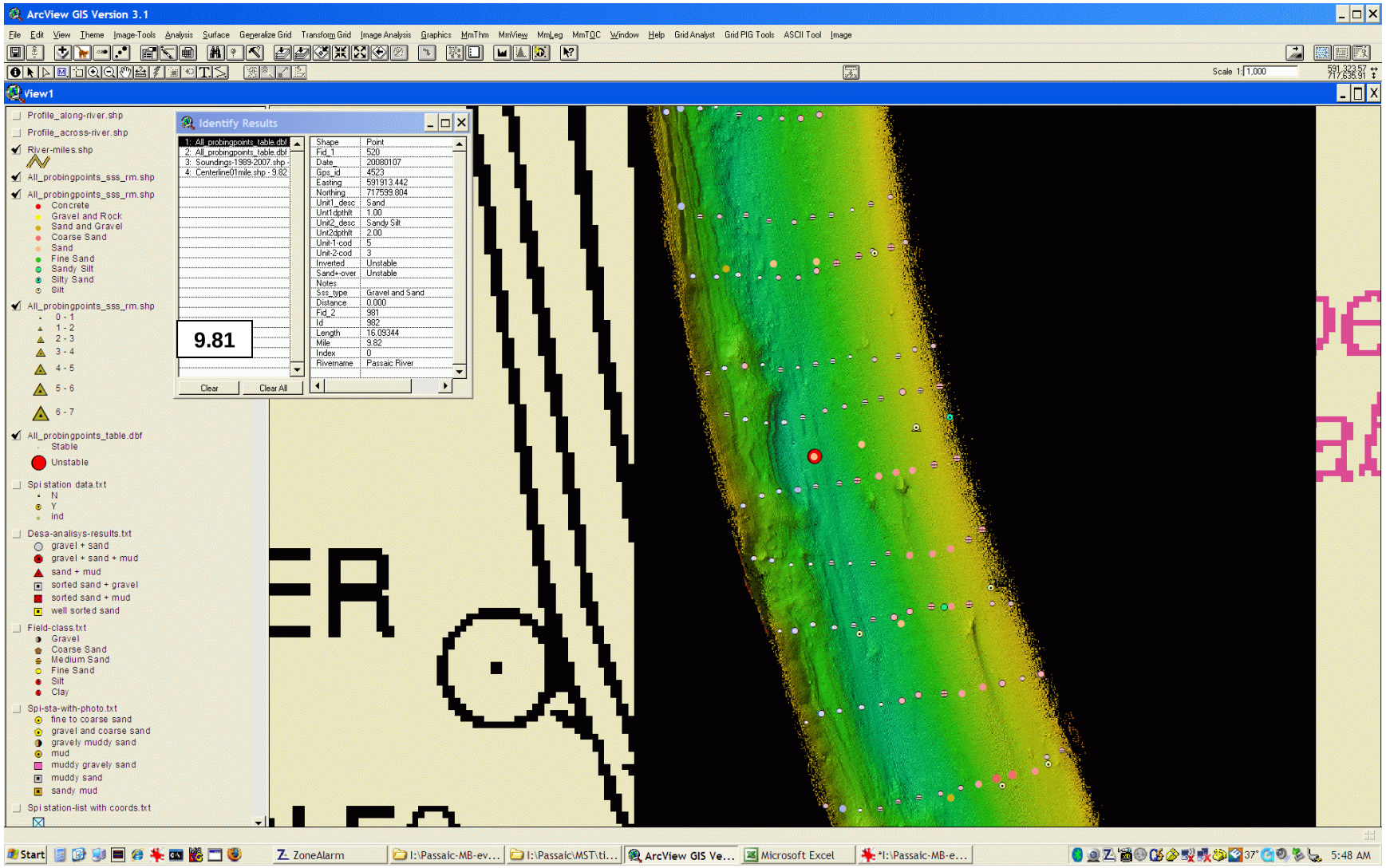
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
8.94
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
Concrete
Gravel and Rock
Sand and Gravel
Coarse Sand
Sand
Fine Sand
Sandy Silt
Silty Sand
Silt
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
N
Y
ind
Desa-analisys-results.txt
gravel + sand
gravel + sand + mud
sand + mud
sorted sand + gravel
sorted sand + mud
well sorted sand
Field-class.txt
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt
Clay
Spi-sta-with-photo.txt
fine to coarse sand
gravel and coarse sand
gravely muddy sand
mud
muddy gravely sand
muddy sand
sandy mud
Spi station-list with coords.txt
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
5:35 AM

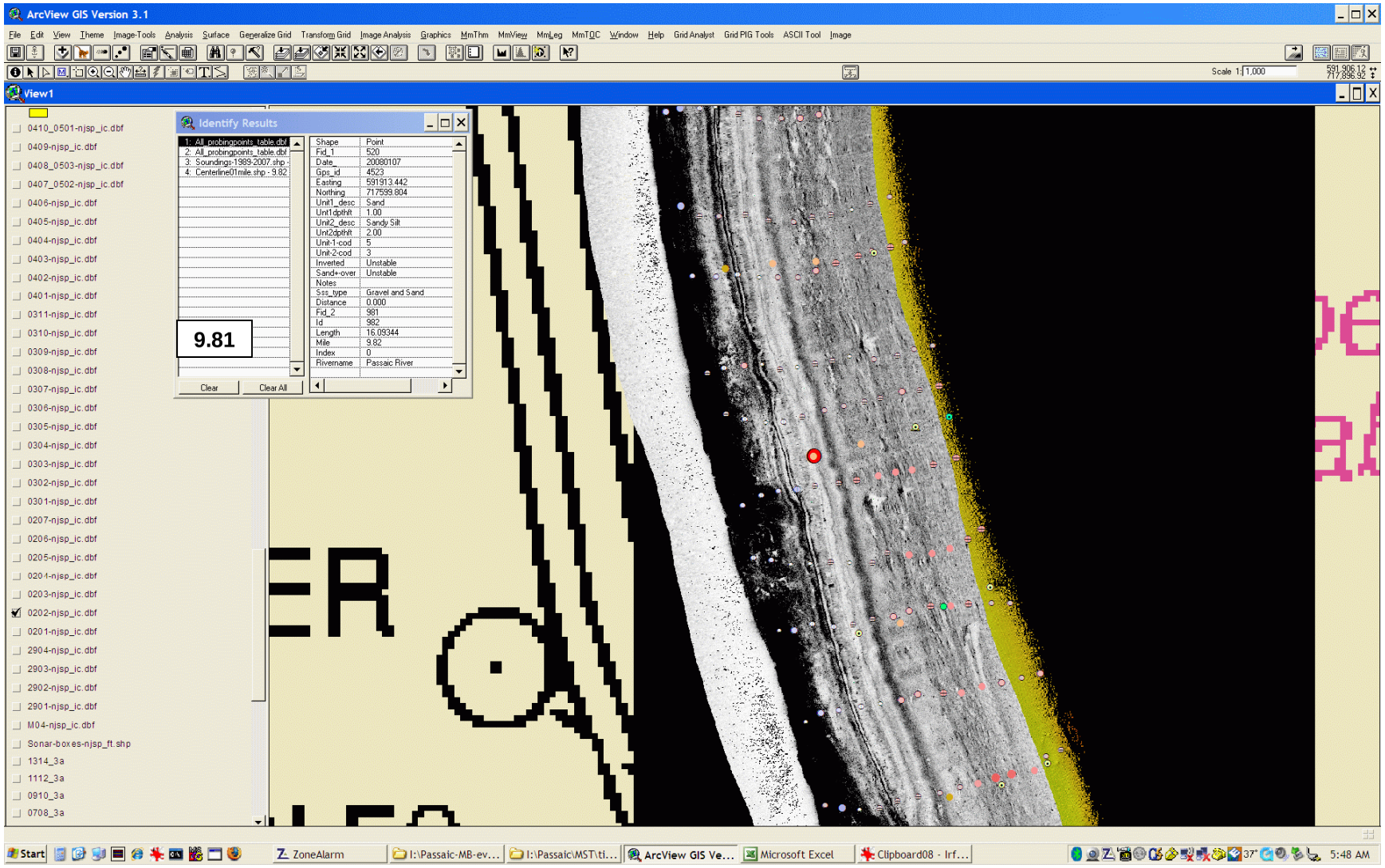
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
River-miles.shp
All_probingpoints_sss_rm.shp
All_probingpoints_sss_rm.shp
Concrete
Gravel and Rock
Sand and Gravel
Coarse Sand
Sand
Fine Sand
Sandy Silt
Silty Sand
Silt
All_probingpoints_sss_rm.shp
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
9.40
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
N
Y
ind
Desa-analisys-results.txt
gravel + sand
gravel + sand + mud
sand + mud
sorted sand + gravel
sorted sand + mud
well sorted sand
Field-class.txt
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt
Clay
Spi-sta-with-photo.txt
fine to coarse sand
gravel and coarse sand
gravely muddy sand
mud
muddy gravely sand
muddy sand
sandy mud
Spi station-list with coords.txt
Allfil33.shp
K
Start
ZoneAlarm
2 Window...
ArcView Gl...
xsections-r...
3 IrfanView
Stability-Re...
Roger Flood...
Windows Ta...
10:34 AM

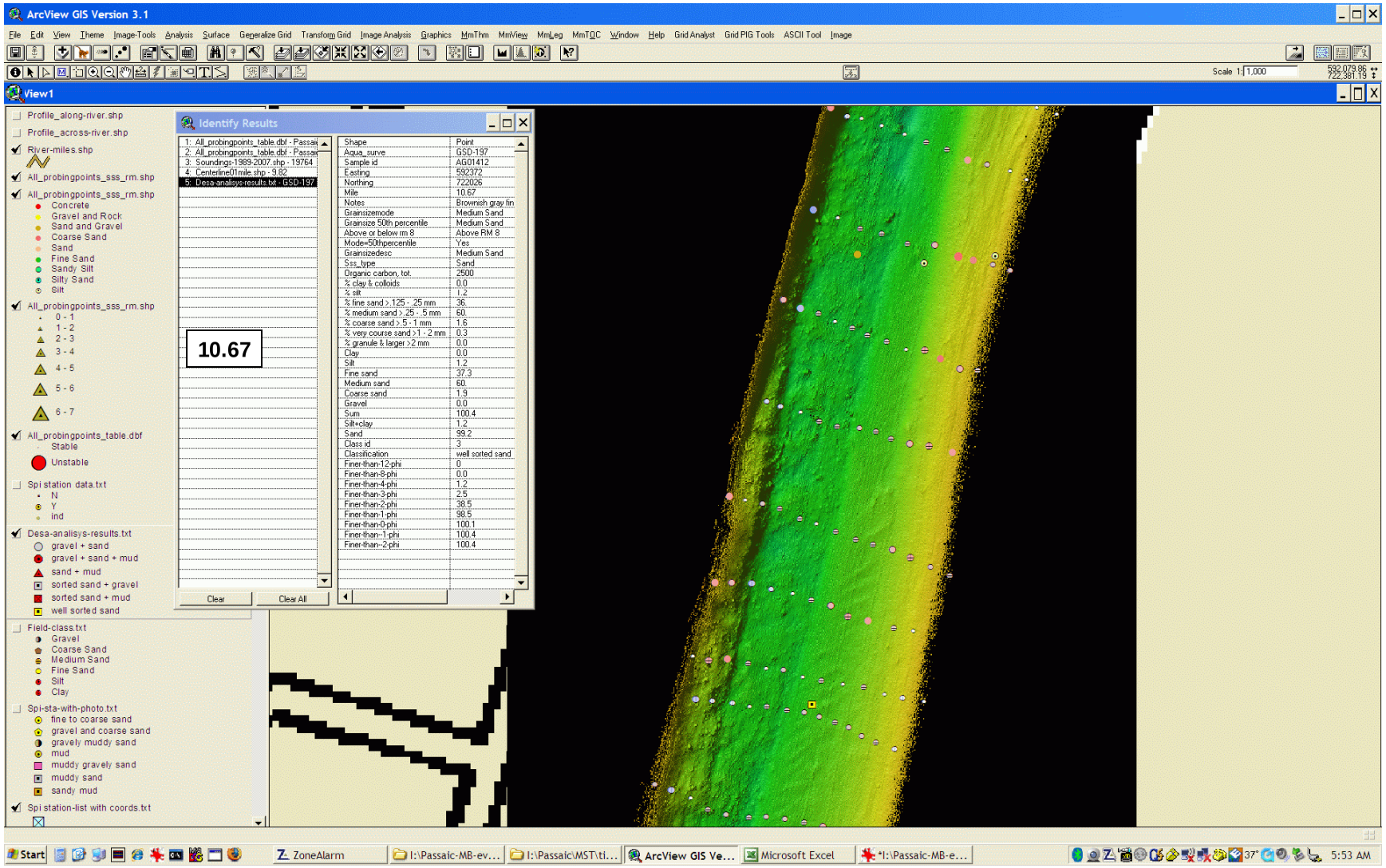
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
9.81
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
Concrete
Gravel and Rock
Sand and Gravel
Coarse Sand
Sand
Fine Sand
Sandy Silt
Silty Sand
Silt
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
N
Y
ind
Desa-analisys-results.txt
gravel + sand
gravel + sand + mud
sand + mud
sorted sand + gravel
sorted sand + mud
well sorted sand
Field-class.txt
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt
Clay
Spi-sta-with-photo.txt
fine to coarse sand
gravel and coarse sand
gravely muddy sand
mud
muddy gravely sand
muddy sand
sandy mud
Spi station-list with coords.txt
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
5:48 AM

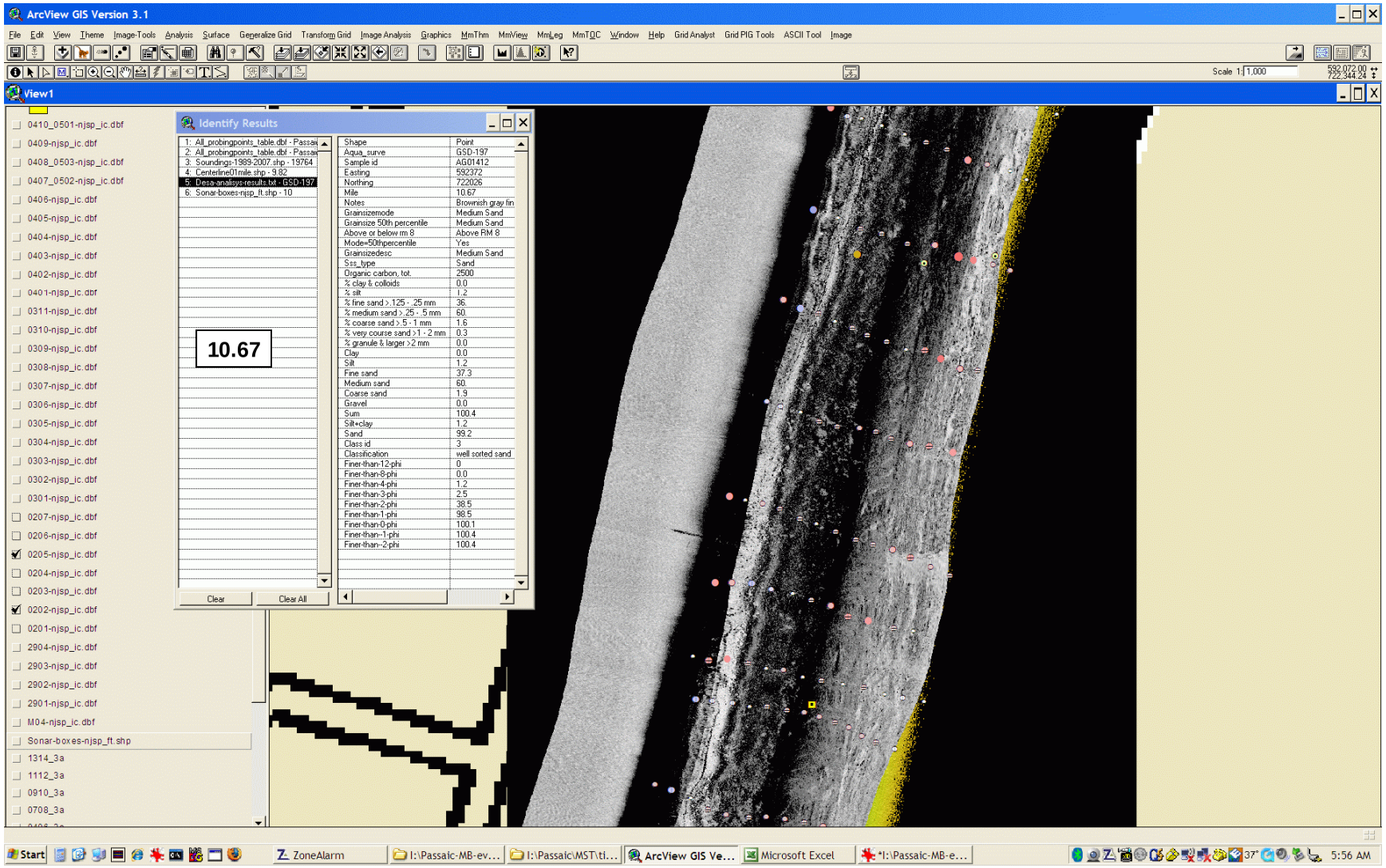
400 ft


ArcView GIS Version 3.1
View1
Identify Results
1: All_probingpoints_table.dbf
2: All_probingpoints_table.dbf
3: Soundings-1989-2007.shp
4: Centerline01mile.shp - 9.82
Shape Point
Fid_1 520
Date 20080107
Gps_id 4523
Easting 591913.442
Northing 717599.804
Unit1_desc Sand
Unit1dpthft 1.00
Unit2_desc Sandy Silt
Unit2dpthft 2.00
Unit-1-cod 5
Unit-2-cod 3
Inverted Unstable
Sand-over Unstable
Notes
Sss_type Gravel and Sand
Distance 0.000
Fid_2 981
Id 982
Length 16.09344
Mile 9.82
Index 0
Rivername Passaic River
9.81
Clear
Clear All
0410_0501-njsp_ic.dbf
0409-njsp_ic.dbf
0408_0503-njsp_ic.dbf
0407_0502-njsp_ic.dbf
0406-njsp_ic.dbf
0405-njsp_ic.dbf
0404-njsp_ic.dbf
0403-njsp_ic.dbf
0402-njsp_ic.dbf
0401-njsp_ic.dbf
0311-njsp_ic.dbf
0310-njsp_ic.dbf
0309-njsp_ic.dbf
0308-njsp_ic.dbf
0307-njsp_ic.dbf
0306-njsp_ic.dbf
0305-njsp_ic.dbf
0304-njsp_ic.dbf
0303-njsp_ic.dbf
0302-njsp_ic.dbf
0301-njsp_ic.dbf
0207-njsp_ic.dbf
0206-njsp_ic.dbf
0205-njsp_ic.dbf
0204-njsp_ic.dbf
0203-njsp_ic.dbf
0202-njsp_ic.dbf
0201-njsp_ic.dbf
2904-njsp_ic.dbf
2903-njsp_ic.dbf
2902-njsp_ic.dbf
2901-njsp_ic.dbf
M04-njsp_ic.dbf
Sonar-boxes-njsp_ft.shp
1314_3a
1112_3a
0910_3a
0708_3a
Start
ZoneAlarm
I:\Passaic-MB-ev...
I:\Passaic\MST\ti...
ArcView GIS Ve...
Microsoft Excel
Clipboard08 - Irf...
5:48 AM

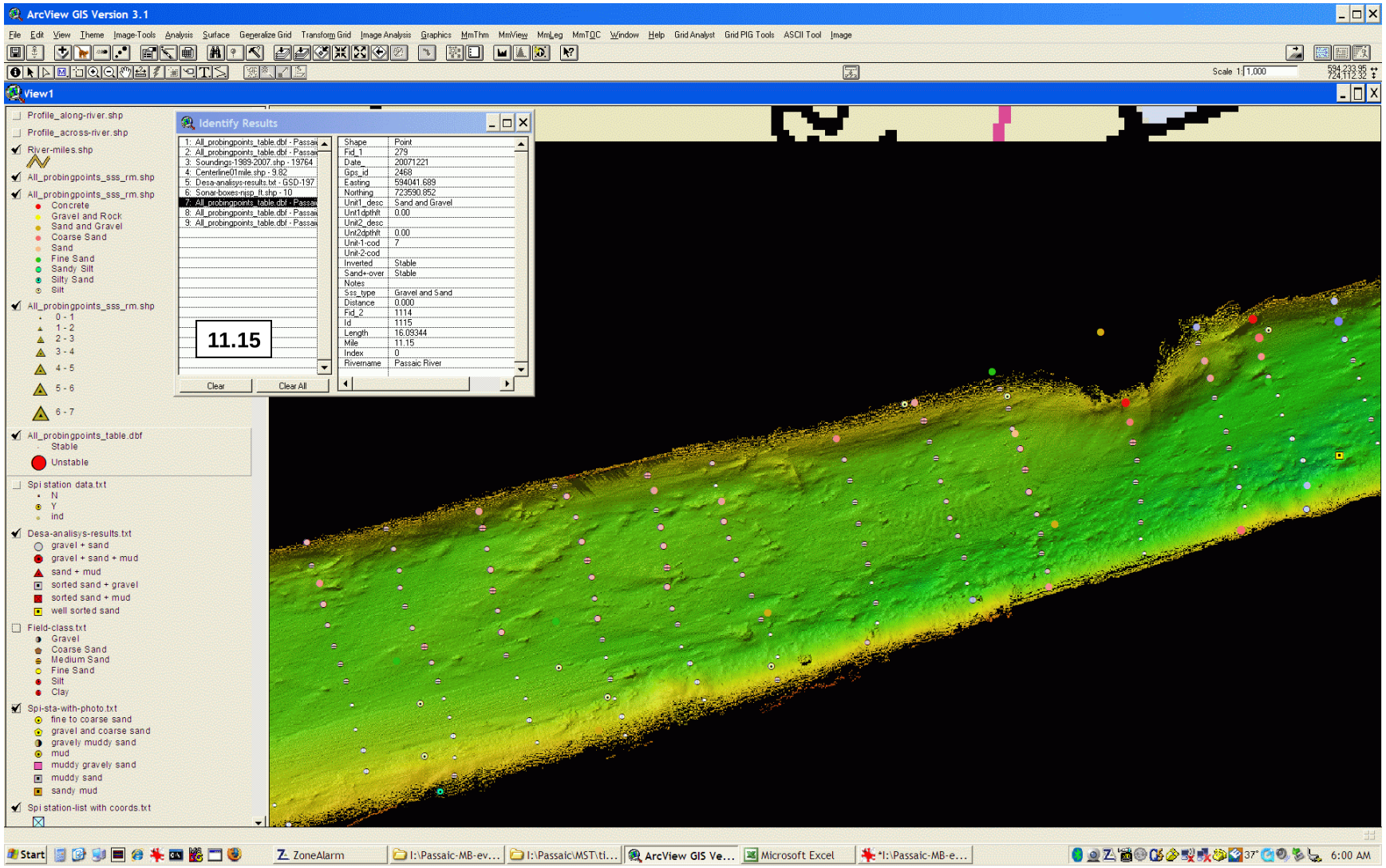
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
10.67
Clear
Clear All
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
5:53 AM

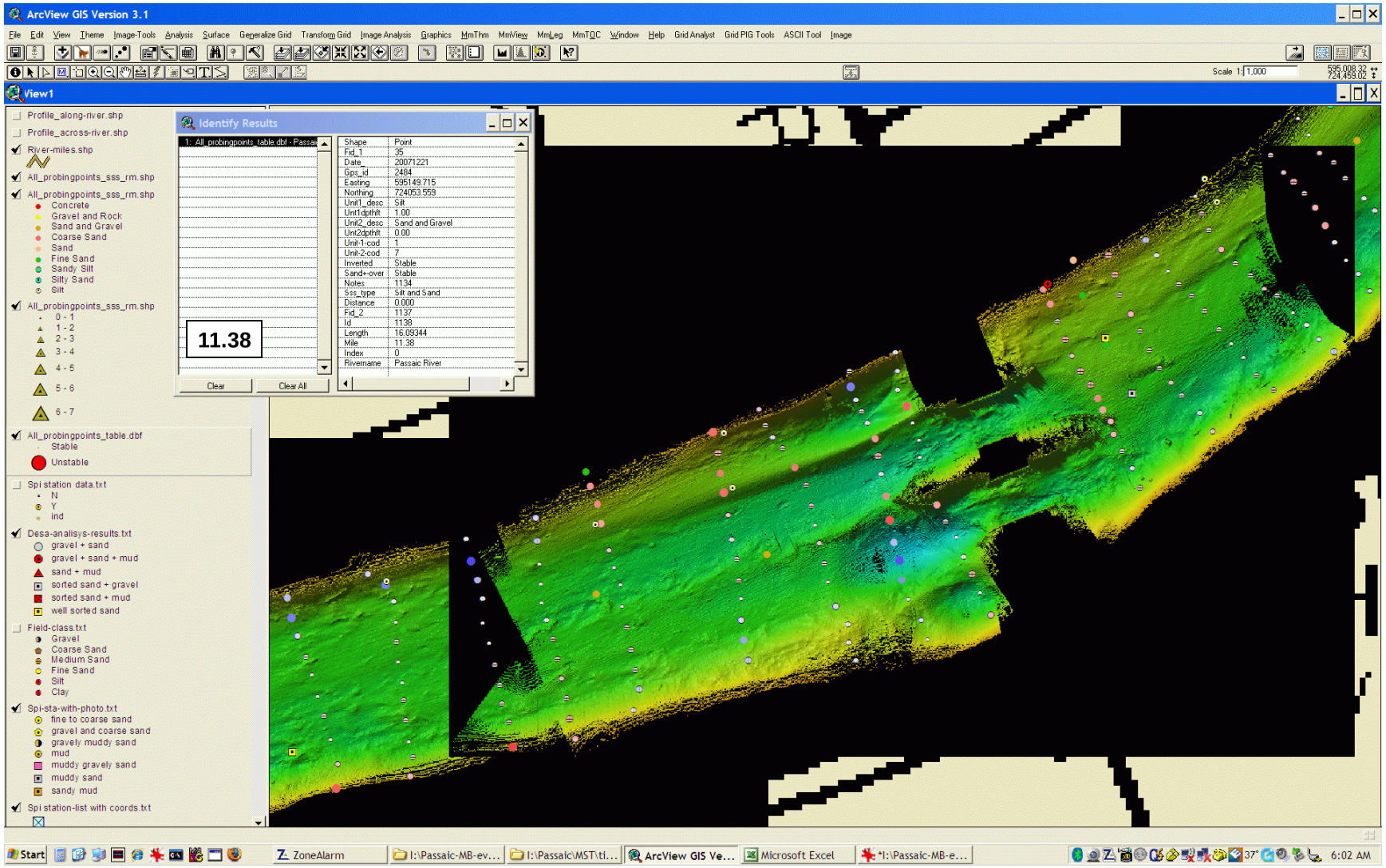
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
10.67
Clear
Clear All
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
5:56 AM

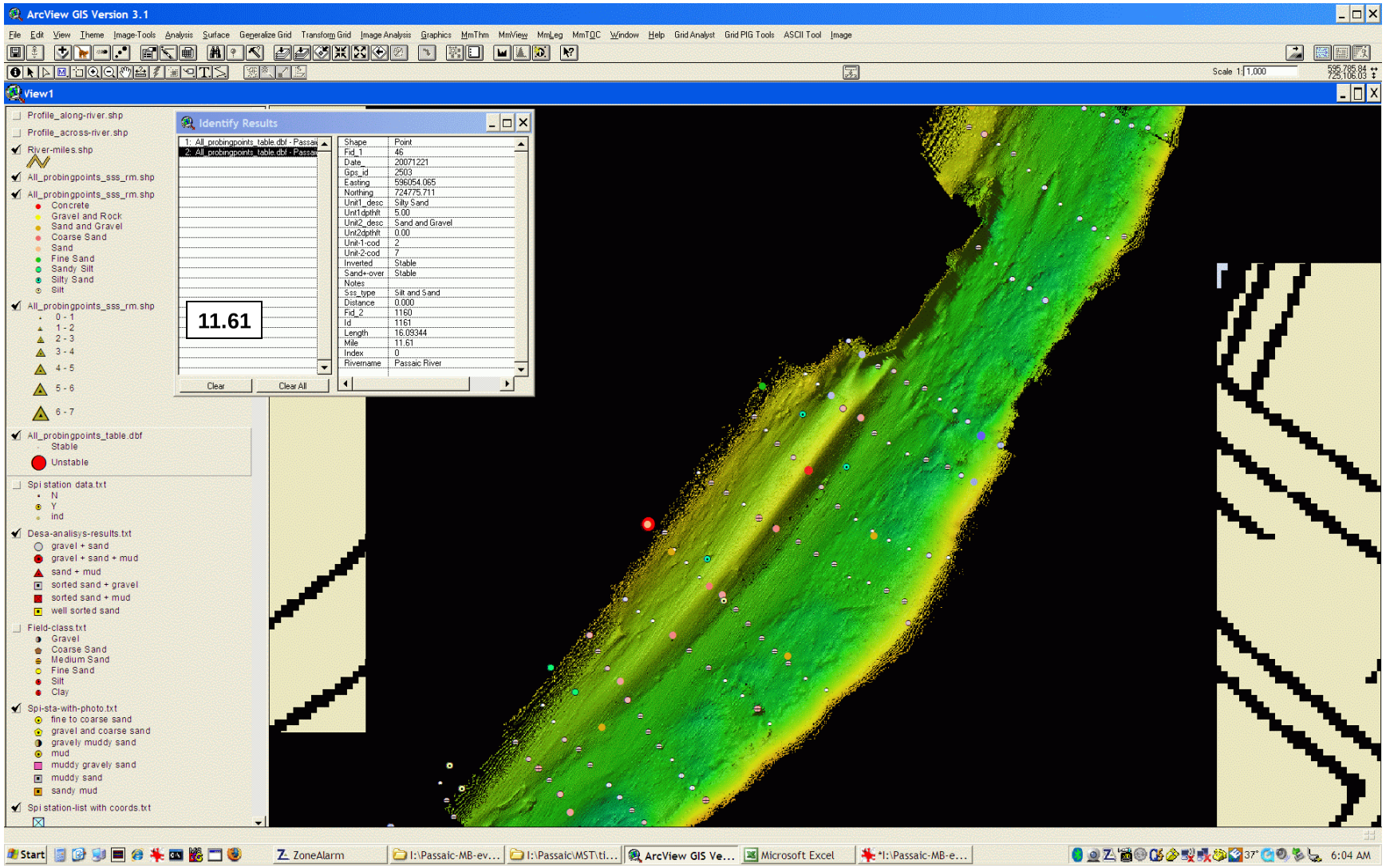
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
11.15
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
Desa-analisys-results.txt
Field-class.txt
Spi-sta-with-photo.txt
Spi station-list with coords.txt
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
6:00 AM

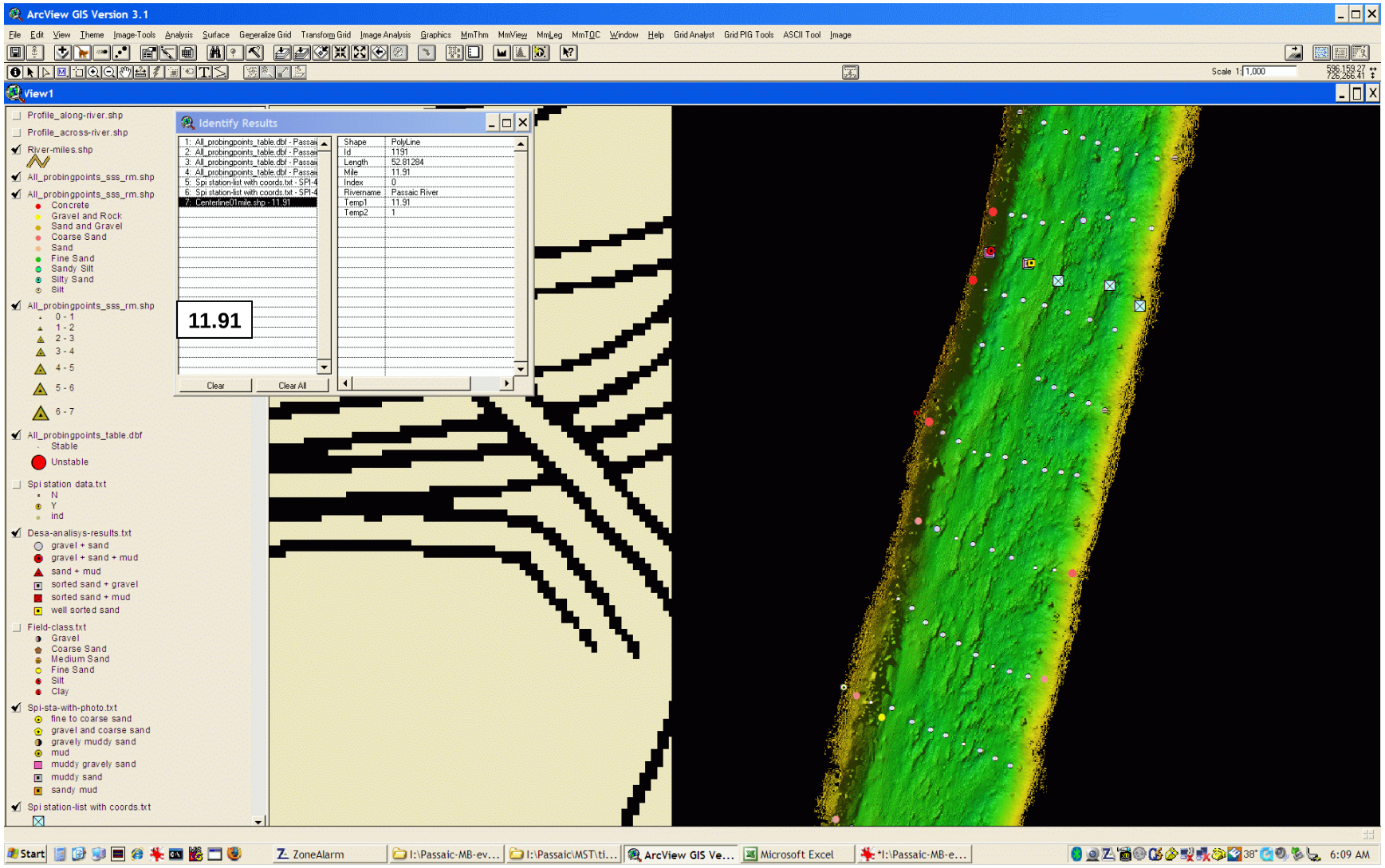
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
11.38
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
Concrete
Gravel and Rock
Sand and Gravel
Coarse Sand
Sand
Fine Sand
Sandy Silt
Silty Sand
Silt
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
N
Y
ind
Desa-analisys-results.txt
gravel + sand
gravel + sand + mud
sand + mud
sorted sand + gravel
sorted sand + mud
well sorted sand
Field-class.txt
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt
Clay
Spi-sta-with-photo.txt
fine to coarse sand
gravel and coarse sand
gravely muddy sand
mud
muddy gravely sand
muddy sand
sandy mud
Spi station-list with coords.txt
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
6:02 AM

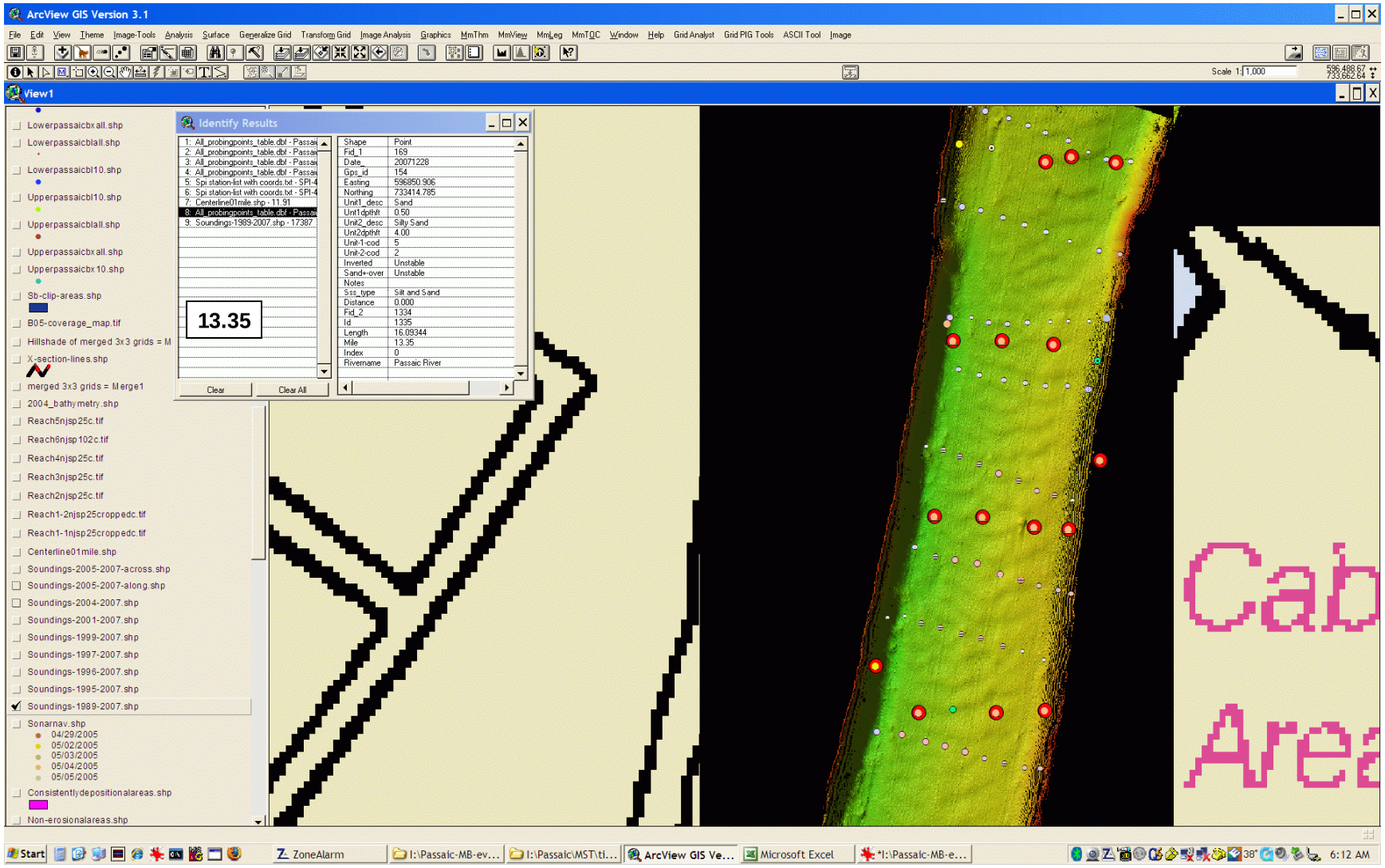
400 ft


ArcView GIS Version 3.1
View1
Identify Results
11.61
Shape Point
Fid_1 46
Date_ 20071221
Gps_id 2503
Easting 596054.065
Northing 724775.711
Unit1_desc Silty Sand
Unit1dpthft 5.00
Unit2_desc Sand and Gravel
Unit2dpthft 0.00
Unit-1-cod 2
Unit-2-cod 7
Inverted Stable
Sand-over Stable
Notes
Sss_type Silt and Sand
Distance 0.000
Fid_2 1160
Id 1161
Length 16.09344
Mile 11.61
Index 0
Rivername Passaic River
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
Concrete
Gravel and Rock
Sand and Gravel
Coarse Sand
Sand
Fine Sand
Sandy Silt
Silty Sand
Silt
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
N
Y
ind
Desa-analisys-results.txt
gravel + sand
gravel + sand + mud
sand + mud
sorted sand + gravel
sorted sand + mud
well sorted sand
Field-class.txt
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt
Clay
Spi-sta-with-photo.txt
fine to coarse sand
gravel and coarse sand
gravely muddy sand
mud
muddy gravely sand
muddy sand
sandy mud
Spi station-list with coords.txt
Start
ZoneAlarm
I:\Passaic-MB-ev...
I:\Passaic\MST\ti...
ArcView GIS Ve...
Microsoft Excel
*I:\Passaic-MB-e...
6:04 AM

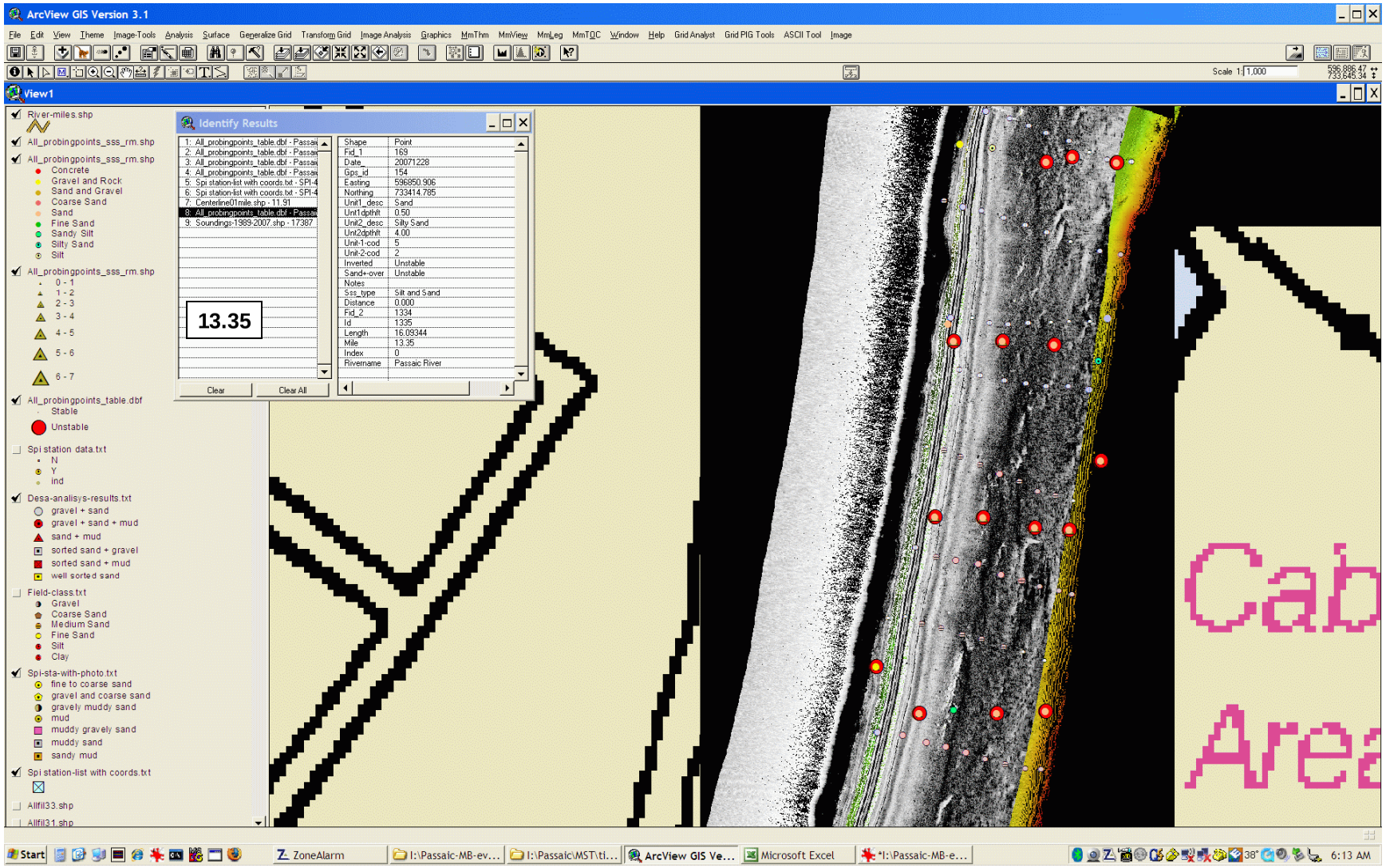
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
11.91
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
All_probingpoints_sss_rm.shp
Concrete
Gravel and Rock
Sand and Gravel
Coarse Sand
Sand
Fine Sand
Sandy Silt
Silty Sand
Silt
All_probingpoints_sss_rm.shp
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
N
Y
ind
Desa-analisys-results.txt
gravel + sand
gravel + sand + mud
sand + mud
sorted sand + gravel
sorted sand + mud
well sorted sand
Field-class.txt
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt
Clay
Spi-sta-with-photo.txt
fine to coarse sand
gravel and coarse sand
gravely muddy sand
mud
muddy gravely sand
muddy sand
sandy mud
Spi station-list with coords.txt
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
6:09 AM

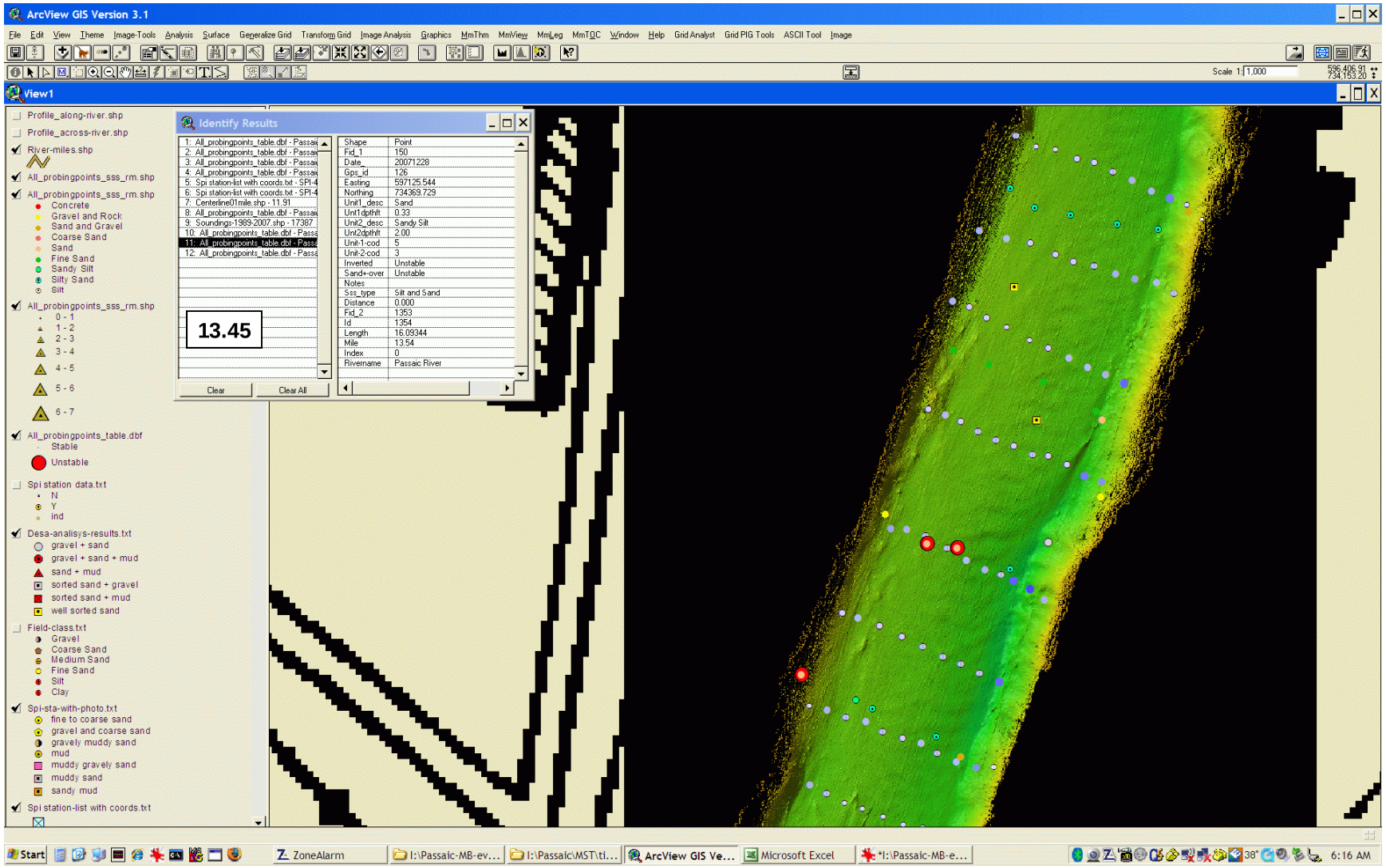
400 ft


ArcView GIS Version 3.1
View1
Identify Results
13.35
Clear
Clear All
Cab
Area
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
6:12 AM

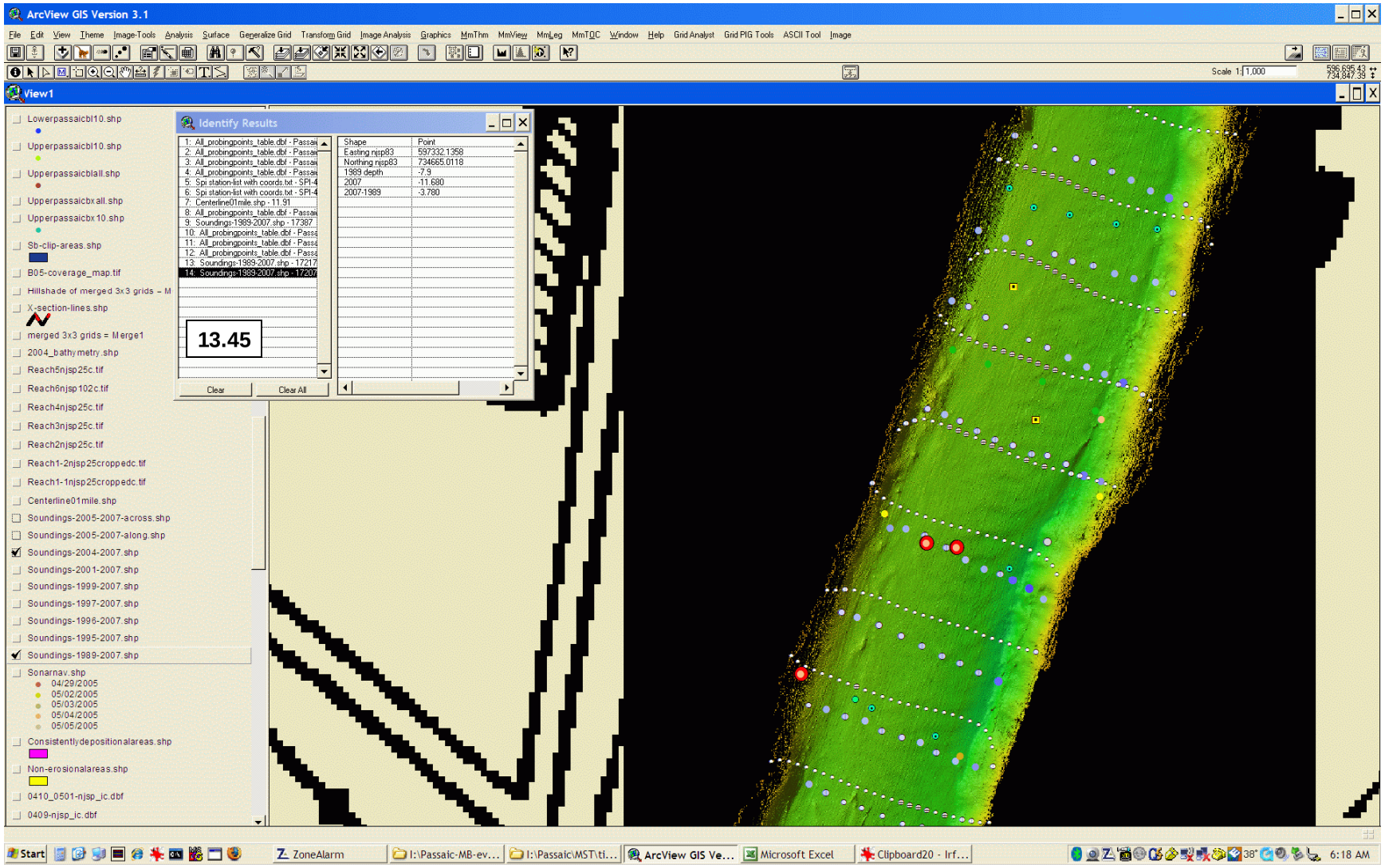
400 ft


ArcView GIS Version 3.1
View1
Identify Results
13.35
Clear
Clear All
Cab
Area
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
6:13 AM

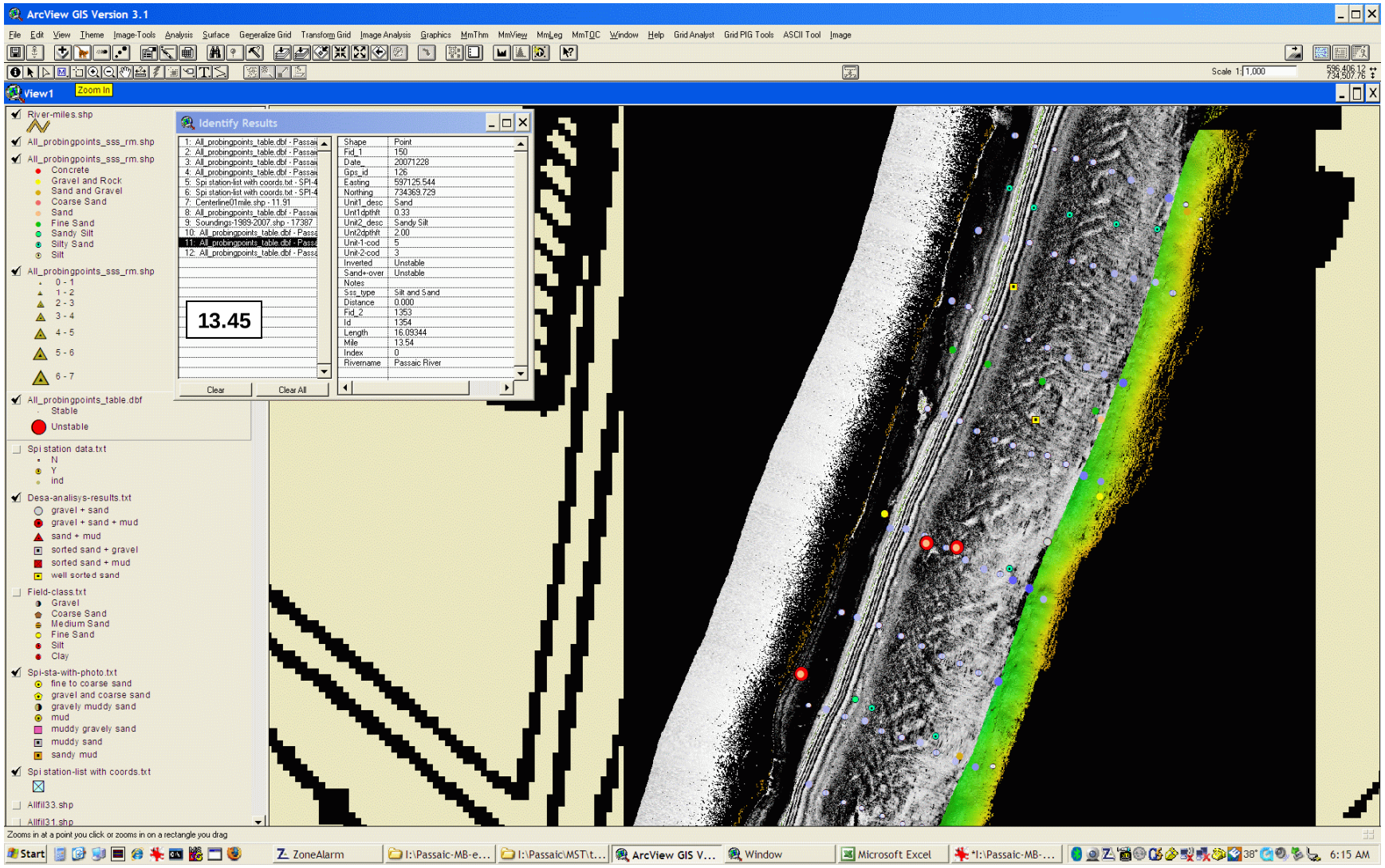
400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
13.45
Clear
Clear All
Profile_along-river.shp
Profile_across-river.shp
River-miles.shp
All_probingpoints_sss_rm.shp
All_probingpoints_sss_rm.shp
Concrete
Gravel and Rock
Sand and Gravel
Coarse Sand
Sand
Fine Sand
Sandy Silt
Silty Sand
Silt
All_probingpoints_sss_rm.shp
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
N
Y
ind
Desa-analisys-results.txt
gravel + sand
gravel + sand + mud
sand + mud
sorted sand + gravel
sorted sand + mud
well sorted sand
Field-class.txt
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt
Clay
Spi-sta-with-photo.txt
fine to coarse sand
gravel and coarse sand
gravely muddy sand
mud
muddy gravely sand
muddy sand
sandy mud
Spi station-list with coords.txt
Start
ZoneAlarm
ArcView GIS Ve...
Microsoft Excel
6:16 AM

400 ft


ArcView GIS Version 3.1
File Edit View Theme Image-Tools Analysis Surface Generalize Grid Transform Grid Image Analysis Graphics MmThm MmView MmLeg MmTOC Window Help Grid Analyst Grid PIG Tools ASCII Tool Image
View1
Identify Results
Shape
Point
Easting njsp83
597332.1358
Northing njsp83
734665.0118
1989 depth
-7.9
2007
-11.680
2007-1989
-3.780
13.45
Clear
Clear All
Lowerpassaicbl10.shp
Upperpassaicbl10.shp
Upperpassaicblall.shp
Upperpassaicbxall.shp
Upperpassaicbx10.shp
Sb-clip-areas.shp
B05-coverage_map.tif
Hillshade of merged 3x3 grids – M
X-section-lines.shp
merged 3x3 grids = Merge1
2004_bathymetry.shp
Reach5njsp25c.tif
Reach6njsp102c.tif
Reach4njsp25c.tif
Reach3njsp25c.tif
Reach2njsp25c.tif
Reach1-2njsp25croppedc.tif
Reach1-1njsp25croppedc.tif
Centerline01mile.shp
Soundings-2005-2007-across.shp
Soundings-2005-2007-along.shp
Soundings-2004-2007.shp
Soundings-2001-2007.shp
Soundings-1999-2007.shp
Soundings-1997-2007.shp
Soundings-1996-2007.shp
Soundings-1995-2007.shp
Soundings-1989-2007.shp
Sonarnav.shp
04/29/2005
05/02/2005
05/03/2005
05/04/2005
05/05/2005
Consistentlydepositionalareas.shp
Non-erosionalareas.shp
0410_0501-njsp_ic.dbf
0409-njsp_ic.dbf
Start
ZoneAlarm
I:\Passaic-MB-ev...
I:\Passaic\MST\ti...
ArcView GIS Ve...
Microsoft Excel
Clipboard20 - Irf...
6:18 AM

400 ft


ArcView GIS Version 3.1
View1
Zoom In
Identify Results
13.45
Clear
Clear All
River-miles.shp
All_probingpoints_sss_rm.shp
All_probingpoints_table.dbf
Stable
Unstable
Spi station data.txt
Desa-analisys-results.txt
Field-class.txt
Spi-sta-with-photo.txt
Spi station-list with coords.txt
Allfil33.shp
Allfil31.shp
Zooms in at a point you click or zooms in on a rectangle you drag

400 ft